2

AIRFIELD PAVEMENT EVALUATION

OF

BOLIVIAN AIRFIELDS

PREPARED FOR

TACTICAL AIR COMMAND (TAC)

BY

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EXECUTIVE SUMMARY

The purposes of these

1. At the request of Tactical Air Command, a Pavement Evaluation Team from HQ Air Force Engineering and Services Center (AFESC) performed modified destructive airfield pavement evaluations at Potosi and Sucre, Bolivia during 15-23 April 1989. The purposes were to establish physical property data, determine pavement load carrying capabilities, and identify any existing or potential pavement distresses.

2. POTOSI AIRFIELD

Pavement conditions at Potosi extend from VERY GOOD to FAILED with the majority of the runway in VERY GOOD condition. The primary reason for the runway condition is the limited amount and type of aircraft that use the airfield. Although runway conditions do not indicate structural overloading, most of the runway is not strong enough to support C-130 operations. Specific load carrying capabilities are outlined in the Potosi Allowable Gross Load Table, Appendix F. Load carrying capabilities of the apron and access taxiways are also limited. Recommend the runway and adjoining pavements be structurally enhanced.

3. SUCRE AIRFIELD

Pavement conditions at Sucre are VERY GOOD, or better. Distresses are limited to isolated low severity longitudinal, transverse and map cracks. Joint sealant is, generally, in GOOD condition. The apparent distresses have been well-maintained, which is indicative of sound engineering practices. No signficant load limitations exist on the airfield. Specific load carrying capabilities are outlined in the Sucre section of Appendix F.

SECTION I: INTRODUCTION

A. SCOPE

A Headquarters Air Force Engineering and Services Center (HQ AFESC) Pavement Evaluation Team (PET) performed modified destructive airfield pavement evaluations at Potosi and Sucre, Bolivia, at the request of Headquarters, Tactical Air Command (TAC). Field testing was accomplished during 15-23 April 1989. The purposes of the evaluations were to investigate distress patterns on the airfields, establish physical property data, determine the in situ properties of the pavement structures for calculating allowable gross loads (AGLs), and identify reasons for existing or potential pavement distress.

This report is intended as an aid to individuals, organizations, and agencies. With this in mind, the narrative is brief but is supplemented by many detailed appendices. Potosi pavement evaluation is reported first in each section, followed by the Sucre evaluation. A list of the included appendices is provided below.

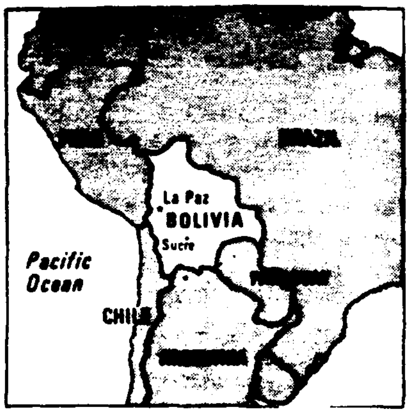
Appendix	Description
A	Airfield Layout Plan: This plan graphically depicts different pavement features of the airfield.
B	This appendix not used.
C	Test Location and Core Location Plans: These plans document the locations where tests were conducted and cores were extracted. Core thicknesses and flexural strengths are also recorded on the core location plan.
D	Condition Survey: This plan shows the operating condition of the airfield pavements. The condition ratings are a qualitative assessment of the pavement surface conditions based upon visual observations and engineering judgement.
E	Summary of Physical Property Data: Physical properties of each pavement feature are tabulated. Included are feature dimensions, material types, thicknesses of layers, and engineering properties.

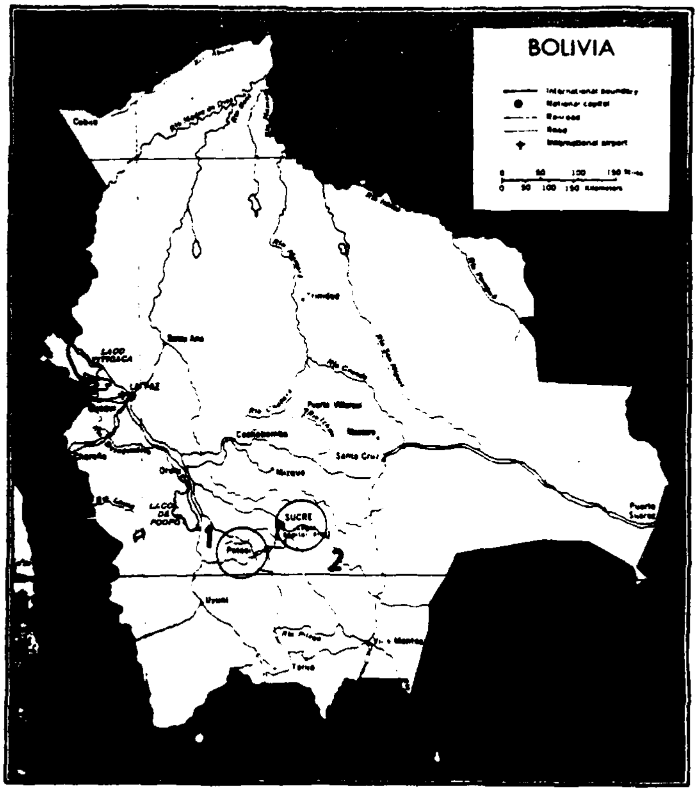
F Allowable Gross Loads (AGLs): A listing of the allowable magnitude of loads at four pass intensity levels for each aircraft group.

G Related Information: Included in this are Aircraft Group Indices, Gross Weight Limits for Aircraft Groups, Pass Intensity Levels, Climatological Chart, and Climatological Narrative.

B. SITE LOCATIONS

Potosi is located in the Andes Mountains of Bolivia. The elevation is approximately 13,500 feet above sea level. The team flew into Sucre via a C-130 and drove up the mountain on a gravel road to Potosi. Sucre is also in the Andes, but at approximately 10,000 feet above sea level. Respective locations are shown in the map below.





1. Potosi 2. Sucre

SECTION II. EVALUATION PROCEDURES

A. FIELD TESTING

Potosi airfield pavement testing included California Bearing Ratio (CBR) tests, Small Aperture Tests (SAT) and Dynamic Cone Penetrometer (DCP) tests. The DCP measures penetration resistance of the subsurface soils. The resistance values were then correlated to corresponding CBRs used for design and evaluation of flexible pavements. Original testing at Potosi was to be limited to SAT and various penetration tests, but the material was such that four (4) test pits were excavated on the runway.

Pavement testing at Sucre Airfield was done by extracting pavement cores and conducting SAT and DCP tests in the pavement core holes. Sucre airfield pavements are Portland cement concrete (PCC), hence all CBRs were correlated to moduli of subgrade reaction (k-values) used in design and evaluation of rigid pavements.

Field testing also included pavement core and soil sampling. The cores were used to verify pavement thicknesses and construction, as well as to help determine pavement strength characteristics and life expectancy. Test and core locations are shown in Appendix C.

B. CONDITION RATINGS

Pavement condition definitions range from EXCELLENT (like new) to FAILED (unsafe for aircraft traffic). Condition ratings are a qualitative assessment of the pavement surface and should not be confused with the structural capacity of a pavement. For example, a pavement surface may rate EXCELLENT, but have underlying pavement or soil conditions that could result in pavement failure under the applied load of a given aircraft. On the other hand, a pavement may be structurally sound but the surface condition may be hazardous for aircraft traffic.

C. LABORATORY TESTING

Pavement core samples were returned to Tyndall AFB for laboratory testing. PCC cores were tested for strength by tensile splitting in accordance with ASTM's "Standard Test Methods." The six-inch diameter core tensile splitting strengths were then converted to flexural strengths by using an empirical relationship (Ref 4). Flexural strengths are reported on the "Core Location Plan" (Appendix C) and in Appendix E. PCC cores taken at Potosi were below the minimum length for testing. Flexural strengths for these features were estimated from design and construction drawings.

D. MATERIAL PROPERTIES

The load-carrying capacities of the pavements reported herein are based on material properties representative of the in-place conditions at the time this field investigation was conducted. Exact agreement between behavior of the facilities as shown by this evaluation and that which may actually occur under traffic cannot be expected, primarily because of the difficulties of determining the exact traffic that produces the behavior, and also because material properties change due to environmental factors such as precipitation, freeze-thaw cycles, and age. These changes must be considered in future planning, especially where a change in mission will result in an increase in aircraft loads and/or aircraft traffic volume.

E. CLIMATIC DATA

Appendix G provides a summary of climatic data for both airfields.

SECTION III: METHODOLOGY OF ANALYSIS

A. PHYSICAL PROPERTY DATA

The parameters used for this evaluation are summarized in Appendix E. The data presented were selected as the most representative strength values for each feature. Strength of flexible pavements (asphaltic concrete, AC) are based on the the conventional CBR method of design and evaluation. Each unique soil layer was tested to determine the CBR of the layer. CBRs were also measured on the rigid pavement (Portland cement concrete, PCC) supporting soils, and then correlated to moduli of subgrade reaction, or k-value. Rigid pavements were then evaluated based on the Westergaard theory of design and evaluation.

B. DETERMINATION OF ALLOWABLE GROSS LOADS

The AGLs were determined by a computer program based on procedures in AFM 88-24 and AFR 93-5. The AGL for a feature was reduced 25 percent if the condition rating for the feature was POOR or worse. Appendix E outlines the engineering properties used to calculate the AGLs.

Failure criteria used in the allowable load analysis is different for rigid and flexible pavements. Rigid (and composite) pavement failure criteria is partly based on a limiting tensile stress of the concrete. Conversely, compressive subgrade strain is one failure parameter used in the AGL calculation of flexible pavement systems.

C. EXAMPLE PROBLEM

The following example (employing data from this report) illustrates how to use the allowable gross load information.

Problem: The Bolivian government wants to traffic a 150-kip (1 kip = 1000 pounds) 727 on Feature T02A of the Sucre airfield. How many passes can they expect to make before the pavement fails?

Solution: From Appendix F, the Allowable Gross Loads for a 727 at Pass Intensity Levels I-IV (50,000, 15,000, 3,000, and 500) are 120, 139, 168, and + (pavement can support greater than maximum aircraft weight) kips, respectively. The weights and passes are plotted on semi-log paper as shown in Figure 1. The completed graph indicates a 150-kip 727 can make approximately 8,800 passes on Feature T02A before the pavement fails.

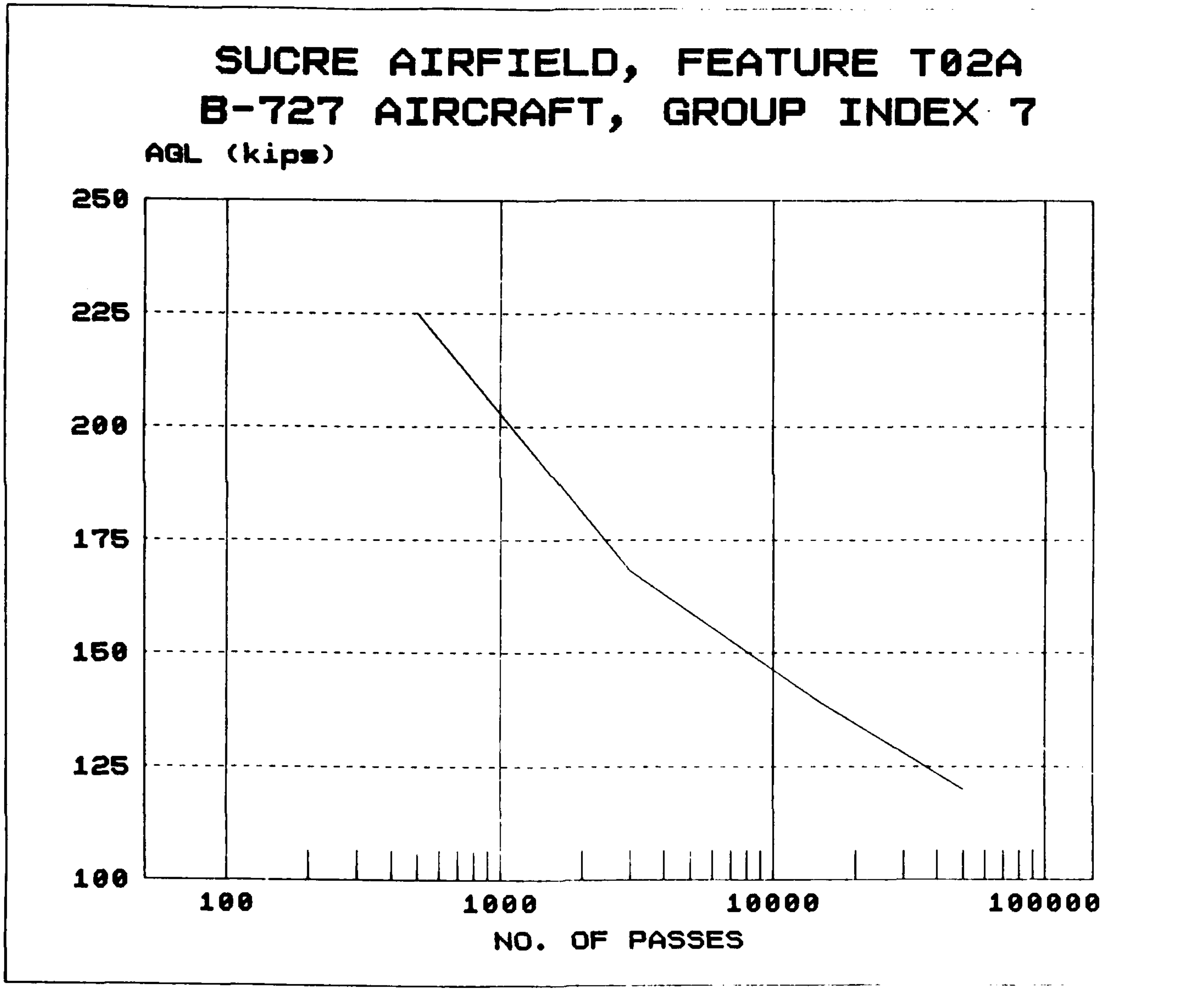

SUCRE AIRFIELD, FEATURE T02A
B-727 AIRCRAFT, GROUP INDEX 7
AGL (kips)
250
225
200
175
150
125
100
100
1000
10000
100000
NO. OF PASSES

Figure 1

D. PAVEMENT CLASSIFICATION NUMBER

The International Civil Aviation Organization (ICAO) has developed and adopted a standardized method of reporting pavement strength. This procedure is known as the Aircraft Classification Number/Pavement Classification Number (ACN/PCN) method (Reference 3). In support of this international system, PCNs are provided for each pavement feature on the different airfields. A brief explanation on the PCN code is shown below for PCN = 31/R/A/W/T.

PCN FIVE-PART CODE

PCN	Pavement Type	Subgrade Strength	Tire Pressure	Method of PCN Determination
Numeric Value	R - Rigid	A	W	T - Technical Evaluation
		B	X	
= 31	F - Flexible	C	Y	U - Using Aircraft
		D	Z	

EXPLANATION OF TERMS:

Subgrade Strength Codes

Code	Category	Flexible Pavement CBR, %	Rigid Pavement k, pci
A	High	Over 13	Over 400
B	Medium	9 - 13	201-400
C	Low	4 - 8	100-200
D	Ultralow	< 4	< 100

Tire Pressure Codes

Code	Category	Tire Pressure, psi
W	High	No Limit
X	Medium	146 - 217
Y	Low	74 - 145
Z	Ultralow	0 - 73

USAF typically reports PCNs based on 50,000 passes of C-141 aircraft. However, Potosi pavements are structurally weak. Because of this, PCNs were calculated based on 500 passes of C-130 aircraft for the Potosi airfield. Conversely, pavements at Sucre are structurally sound, so PCNs were calculated based on Group 9 aircraft (C-141) at Pass Intensity Level I (50,000 passes). PCNs for respective airfields are shown below. Note the PCNs are based on different aircraft and different Pass Intensity levels. They should not be confused.

Pavement Classification Number, PCN
Based on <u>500 Passes of C-130</u>
Potosi, Bolivia

Feature	PCN
R01A	3/F/A/Y/T
R02A	11/F/A/Y/T
R03A	8/F/B/Y/T
R04A	33/F/C/Y/T
T01A	8/F/C/Y/T
T02C	0/F/C/Y/T
A01B	4/F/A/Y/T
A02B	33/R/A/Y/T
A03B	10/R/A/Y/T
A04B	12/R/A/Y/T
A05B	0/F/A/Y/T

Pavement Classification Number, PCN
Based on <u>50,000 Passes of C-141</u>
Sucre, Bolivia

Feature	PCN
R01A	52/R/B/X/T
T01A	47/R/B/X/T
T02A	46/R/C/X/T
T03A	50/R/B/X/T
A01B	49/R/B/X/T
A02B	55/R/B/X/T
A03B	47/R/B/X/T

SECTION IV. PAVEMENT ASSESSMENT

A. POTOSI AIRFIELD

Pavement conditions at Potosi range from VERY GOOD to FAILED with the majority of the runway in VERY GOOD condition. The PCC apron features range from POOR to VERY GOOD condition. PCC thicknesses on the apron vary from 3 to 6 inches. Most distresses are a result of overloading and overfinishing of the concrete. Consequently, transverse, longitudinal, and low severity surface map cracks are present. Specific conditions and recommendations are addressed in the following paragraphs.

1. Runway 06/24:

Runway 06/24 is a four-layer flexible pavement system--a triple bituminous surface treatment, base course, one subbase layer, and the subgrade. SATs were conducted on the base course every 1000 feet along the runway. Subbase strengths were determined by CBR tests in four test pits, and subgrade strengths were determined from DCP testing.

Several thousand yards of material were excavated before the runway was constructed in the 1970s. It is 6580 feet (2000 meters) long, 100 feet wide, with a small flexible pavement turn-around at the 06 end. The surface conditions are generally VERY GOOD with few pavement distresses. There are no signs of structural damage to the runway. As was mentioned before, the surface is a triple bituminous surface treatment about one inch thick. The predominant distress throughout the runway is weathering of the surface. Aggregate and asphalt have separated in isolated spots in the top surface layer only. This is most evident on the 06 end where take-offs occur more frequently. Minor fuel spills may also be a contributing factor. Because of bond loss between the aggregate and asphalt, FOD and debris are present throughout the runway. There is no sweeper located at the airfield to clean the runway surface.

Separation between the surface treatment layers was observed in many of the cores. It is not apparent on the runway surface. Shear failure between the layers may occur under increased traffic and loads. It may also be aggravated by the extreme temperatures in the area. Dur'ng the cold months, the layers may become more brittle, causing a better defined failure plane. Conversely, when the temperatures rise, traffic may tend to compact the layers.

The strength of each layer was determined throughout the runway. The base course thickness varies between 7 and 17 inches with CBR values ranging from 37 to 100. Strength of the base course is consistent for approximately 4000 feet beginning at the 06 end. Values for that area are 40% to 55%. A distinct change occurs approximately 2000 feet from the 24 end of the runway, where the base course strength becomes significantly higher (95+). Conversely, subbase strength at the 06 end is much stronger than the subbase at the 24 end. Subgrade strength was very consistent with CBR values in the 8-12 range. A plot of CBR vs Runway Station is shown for each layer in Appendix C.

The taxiway joining the runway and parking apron is 50 feet wide and is constructed using cement stabilized base course covered by a layer of uniformly graded gravel protected by a single bituminous cutback weathering course. The taxiway is in POOR condition. There are no indications of structural distresses, however, surface conditions warrant such a rating. Because of the aggregate gradation and only one inch of gravel being placed above the cement stabilized material, the surface could not be adequately compacted and treated to a smooth surface. There are also tire marks in the bituminous material near the intersection of the runway. Recommend the taxiway be overlayed with asphaltic concrete (AC) to enhance the structure and surface.

2. Aprons:

There is one main PCC parking apron that consists of three distinct features. Pavement features are distinguished by either different materials, thicknesses, construction, or structural capacity. The second apron, which is no longer usable, is located approximately 2000 feet from the 06 end. It was originally constructed of a single bituminous surface treatment overlaying the base and the subgrade.

The main parking apron is 100 feet wide and 270 feet long at its largest dimensions. The newest addition to the apron is approximately 100 ft x 107 ft. This section is in VERY GOOD condition with the only distresses being low severity map cracking. However, the PCC is only 6 inches thick. Specific pavement characteristics are outlined in the Summary of Physical Property Data, Appendix E.

The other two main apron features, A03B and A04B, are in VERY POOR AND POOR condition, respectively. The PCC pavement is only 3-5 inches thick with low strength supporting soils. The slabs were constructed such that transverse joints were offset 1/2 slab length on adjacent rows. Consequently, the joint cracks are propagating into adjacent slabs and furthering the pavement degradation. Other common distresses include scaling, medium severity longitudinal and transverse cracks, map cracking, joint spalls, and D-cracking. These are environmentally related and load related distresses. Load calculations indicate these features, as most others, cannot safely sustain heavy aircraft loadings. Specifics are outlined in the AGL tables, Appendix F. Recommend the entire apron be replaced.

The unusable apron, Apron 2, was tested with the DCP. It originally consisted of a single bituminous surface treatment which has since deteriorated and is no longer a functional weathering course. Vegetation growth is quite extensive and the pavement is not capable of supporting aircraft. If the area is to be used, a total reconstruction is recommended.

Analysis of the runway pavements at Potosi indicate the airfield cannot support C-130 operations without damaging the pavement and possibly, the aircraft. Features R02A and R04A can support limited operations, but the critical features are R01A and R03A. These features cannot support operations listed at the stated four Pass Intensity Levels. The reason for such limited capacity is the minimal AC cover on the base course, and the measured strength of the base course.

The computed AGLs are based on Pass Intensity Levels I-IV which, for a C-130, are 50,000, 15,000, 3,000, and 500 passes respectively. In addition to that, loads were evaluated for C-130 aircraft based on 100 passes. The calculations were based on an airfield pavement evaluation program developed by the US Army Corps of Engineers. The following table indicates the load carrying capability of runway features based on 100 passes of C-130 aircraft.

Table 1.

Allowable Gross Load (AGL)
Based 100 Passes of C-130 Aircraft

Feature	AGL (kips)	Comment
R01A	68	Less than empty weight of aircraft
R02A	100	
R03A	80	Near minimum aircraft weight
R04A	174	Near maximum aircraft weight

As Table 1 indicates, the controlling runway feature, R01A, is not capable of supporting 100 passes of a C-130 aircraft without damaging the pavement, or possibly, the aircraft. If the airfield is to be used for medium and heavy aircraft, recommend the runway and adjoining pavements be structurally rebuilt.

B. SUCRE AIRFIELD

The Sucre airfield is entirely constructed of PCC with a base course covering the in situ subgrade. SATs were conducted every 1000 feet on the runway to obtain a subsurface soil strength profile. Additional tests were then conducted to better define the soil strength profile. SATs were also conducted in the apron and two taxiways. Soil strength profiles are graphically shown in the Sucre Appendix C.

Pavement conditions at Sucre are VERY GOOD, or better. Distresses are limited to isolated low severity longitudinal, transverse and map cracks. Joint sealant is generally, in GOOD condition. The distresses that are evident have been well-maintained which is indicative of sound engineering practices. Specific conditions and recommendations are addressed in the following paragraphs.

1. Runway 05/23:

Runway 05/23 is a three-layer rigid pavement system. The airfield was constructed in 1975 under one contract with consistent material throughout. The PCC thickness is 11 to 13 inches thick which is supported by approximately 16 inches of granular base on top of the subgrade. The concrete cores appear very sound with a well-graded aggregate composition. The runway is 9475 feet long and 100 feet wide with a concrete turn-around apron on the 05 end. Significant elevation changes occur along the length of the runway. The elevation is highest at the midpoint and slopes down towards each end. A hill at the 05 end prevents a gradual glide slope for approaching aircraft. Approximately 800 feet from the 23 end is a wire fence separating the runway from a steep valley. Because of the deep valley at RW 23 and the hill at the 05 end, the thresholds have been displaced 1720 and 2350 feet respectively. Subsequently, traffic landings are concentrated approximately 2500 feet from the 05 end.

Runway pavement conditions are generally VERY GOOD with few pavement distresses. There are only isolated signs of structural distresses. For example, in the concentrated touchdown areas are low severity longitudinal and transverse cracks that have been well-maintained. The predominant distress throughout the runway is low severity map cracking. Even these areas are isolated and most have been chipped to sound material and sealed. Additionally, there is evidence of alkali-aggregate reaction in isolated spots on the runway surface. The maintenance throughout is excellent.

The strength of each layer was determined throughout the runway. The base course thickness was constant at 12-18 inches covering the subgrade. CBR strengths for the granular base are generally in the 50-80% range. Strength of the subgrade was investigated using the dynamic cone penetrometer. Generally, only limited load restrictions apply to the Sucre airfield. There are no load restrictions at the current traffic levels. Specific load carrying capabilities are outlined in Appendix F.

2. Taxiways:

There are two taxiways adjoining the main apron at Sucre. One is in VERY GOOD condition and the other is EXCELLENT. The only distresses are longitudinal and transverse cracks that have been well-maintained. These cracks are limited to 250 square feet at the intersection of the apron and Taxiway 2. These cracks may be a result of combination of loading and strength of the subsurface soils. In this area, as in most of the apron, subsurface water was found flowing between the concrete and base course, causing a small void at the interface.

3. Apron:

There is one main PCC parking apron (300 ft x 500 ft) that is in EXCELLENT condition. There are no significant distresses. However, as was previously mentioned, subsurface water was found flowing at the interface of concrete and base course material. The water appears to have washed out some of the fines that act as a binder in the base course. This has also left a small void between the slabs and supporting soil. There are presently no distresses, but structural cracks may occur as loads and frequency increase. Structural cracks have occurred in the taxiway (mentioned above) because the loads are concentrated in a small area, whereas the concentration does not occur on the apron. These cracks, if they occur, will surface over a period of time. Recommend the surface condition be monitored for any PCC cracking.

There are no taxi lines painted on the apron. B-727s are the predominant commercial aircraft that use the airport facilities. Taxiing aircraft follow the same general path which occasionally results in the main gears falling on the concrete joints. Recommend a taxi line be painted so main gears fall near the center of the PCC slabs.

SECTION V: CONCLUSIONS/RECOMMENDATIONS

1. Pavements at Potosi airfield should be structurally enhanced to support increased aircraft loads and traffic. Strength tests and pavement conditions warrant such a recommendation.

2. Pavements at Sucre are well-maintained with few distresses. The conditions can be attributed to attention to detail, sound engineering, and limited traffic. Recommend the condition of the Main Apron and Taxiway 2 be monitored for increased deterioration.

SECTION VI: GLOSSARY

Allowable Gross Load (AGL) - The maximum aircraft load that can be supported by a pavement feature for a particular number of passes.

Base or Subbase Courses - Natural or processed materials placed on the subgrade beneath the pavement.

Compacted Subgrade - The upper part of the subgrade, which is compacted to a density greater than the portion of the subgrade below.

Feature - A unique portion of the airfield pavement distinguished by traffic area, pavement type, pavement surface thickness and strength, soil layer thicknesses and strengths, construction period, and surface condition.

Frost Evaluation - Pavement evaluation during the frost-melting period, when the pavement load-carrying capacity will be reduced unless protection has been provided against detrimental frost action in underlying soils.

Pass - On a runway, the movement of an aircraft over an imaginary line 500 feet down from the approach end. On a taxiway, the movement of an aircraft over an imaginary line connecting an apron with the runway. AFR 93-5, Chapter 2.

Pass Intensity Levels (PIL) - Specific repetitions of aircraft over a pavement feature, regardless of time, that are dependent on aircraft design category. AFR 93-5, Chapter 2.

Pavement Condition Index (PCI) - A numerical indicator between 0 and 100 that reflects the structural integrity and surface operational condition of the pavement. AFR 93-5, Chapter 3.

Primary Pavements - Those features that are absolutely necessary for mission aircraft operations. AFR 93-5, Chapter 4.

Subgrade - The natural soil in-place, or fill material, upon which a pavement, base, or subbase course is constructed.

Type A Traffic Areas - Type A Traffic Areas are those pavement facilities that receive the channelized traffic and full design weight of the aircraft. AFM 88-6, Chapter 1.

Type B Traffic Areas - Type B Traffic Areas are considered to be those areas where traffic is more nearly uniform over the full width of the pavement facility, but which receive the full design weight of the aircraft. AFM 88-6, Chapter 1.

Type C Traffic Areas - Type C Traffic Areas are considered to be those on which the volume of traffic is low or the applied weight of the operating aircraft is less than the design weight. AFM 88-6, Chapter 1.

PAVEMENT CONDITION EVALUATION TERMINOLOGY

CONDITION RATING	DEFINITION
EXCELLENT	PAVEMENT HAS MINOR OR NO DISTRESS AND WILL REQUIRE ONLY ROUTINE MAINTENANCE.
VERY GOOD	PAVEMENT HAS SCATTERED LOW SEVERITY DISTRESSES WHICH SHOULD NEED ONLY ROUTINE MAINTENANCE.
GOOD	PAVEMENT HAS A COMBINATION OF GENERALLY LOW AND MEDIUM SEVERITY DISTRESSES. MAINTENANCE AND REPAIR NEEDS SHOULD BE ROUTINE TO MAJOR IN THE NEAR-TERM.
FAIR	PAVEMENT HAS LOW, MEDIUM, AND HIGH SEVERITY DISTRESSES WHICH PROBABLY CAUSE SOME OPERATIONAL PROBLEMS. MAINTENANCE AND REPAIR NEEDS SHOULD RANGE FROM ROUTINE TO RECONSTRUCTION IN THE NEAR-TERM.
POOR	PAVEMENT HAS PREDOMINANTLY MEDIUM AND HIGH SEVERITY DISTRESSES CAUSING CONSIDERABLE MAINTENANCE AND OPERATIONAL PROBLEMS. NEAR-TERM MAINTENANCE AND REPAIR NEEDS WILL BE INTENSIVE.
VERY POOR	PAVEMENT HAS MAINLY HIGH SEVERITY DISTRESSES WHICH CAUSE OPERATIONAL RESTRICTIONS. REPAIR NEEDS ARE IMMEDIATE.
FAILED	PAVEMENT DETERIORATION HAS PROGRESSED TO THE POINT THAT SAFE AIRCRAFT OPERATIONS ARE NO LONGER POSSIBLE. COMPLETE RECONSTRUCTION IS REQUIRED.

SECTION VII: CONVERSION FACTORS

BRITISH TO INTERNATIONAL SYSTEMS (SI) OF UNITS

British units of measurements are used in this report and can be converted to SI (Metric) units as follows:

TO CONVERT	TO	MULTIPLY BY
LENGTH		
inch (in)	millimetre (mm)	25.400
inch (in)	metre (m)	0.0254
foot (ft)	metre (m)	0.305
yard (yd)	metre (m)	0.915
mile (mi)	kilometre (km)	1.609
AREA		
square inch (in^2)	square millimetre (mm^2)	645.2
square inch (in^2)	square metre (m^2)	0.0006452
square foot (ft^2)	square metre (m^2)	0.093
square yard (yd^2)	square metre (m^2)	0.8361
square mile (mi^2)	square kilometres (km^2)	2.59
acres	square kilometres (km^2)	0.004046
VOLUME		
cubic inch (in^3)	cubic millimetre (mm^3)	16487.0
cubic foot (ft^3)	cubic metre (m^3)	0.028
cubic yard (yd^3)	cubic metre (m^3)	0.7646
MASS		
pound (lb)	kilogram (kg)	0.454
FORCE		
pound (lb f)	newton (n)	4.448
kip (1000 lb f)	kilogram (kg)	453.6
STRESS		
pound per square inch (psi)	kilo Pascals (kPa)	6.895
MODULUS OF SUBGRADE REACTION (K-VALUE)		
pounds per square inch per inch (psi/in)	kilo Pascals per millimetre (kPa/mm)	0.2715
DEGREES		
degrees Fahrenheit(°F) (F°-32)	degrees Celsius (°C)	5/9
DENSITY		
pounds per cubic foot (pounds mass)	kilogram per cubic meter (kg/m^3)	16.052

REFERENCES

1. AFM 89-3, Materials Testing, February 1971.

2. AFR 93-5, Airfield Pavement Evaluation Program, 18 May 1981.

3. FAA Advisory Circular 150/5335-5, Standardized Method of Reporting Airport Pavement Strength - PCN, 15 June 1983.

4. Hammitt, G. M. III, Concrete Strength Relationships, Research Paper, Texas A&M University, College Station, Texas, December 1971.

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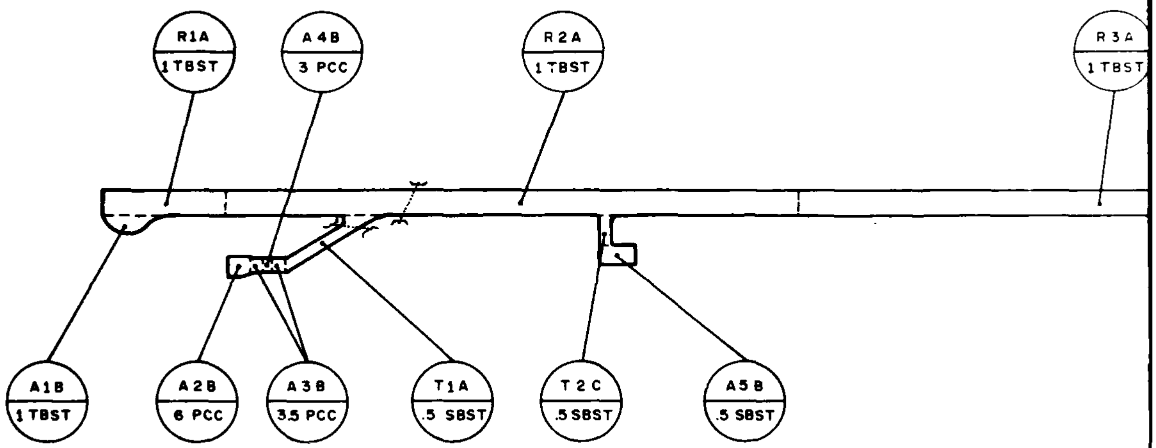


LEGEND

R2A / 1 TBST — FEATURE DESIGNATION (SEE NOTE 1) / PAVEMENT THICKNESS IN INCHES & TYPE

TYPE OF FEATURE

R—RUNWAY
T—TAXIWAY
A—APRON

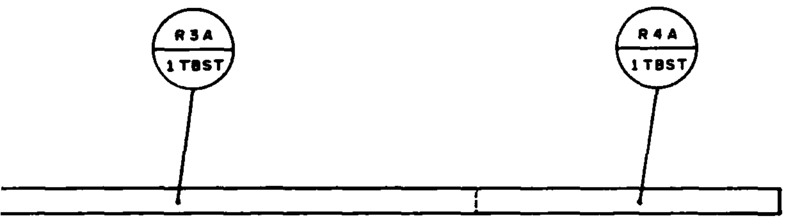
TYPE TRAFFIC AREA (SEE NOTE 2)

A—A TYPE TRAFFIC
B—B TYPE TRAFFIC
C—C TYPE TRAFFIC

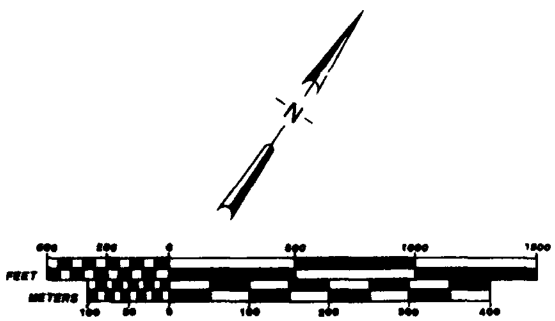
------ CHANGE IN FEATURE DESIGNATION
}------{ CULVERT WITH HEADWALL
PCC PORTLAND CEMENT CONCRETE
SBST SINGLE BITUMINOUS SURFACE TREATMENT
TBST TRIPLE BITUMINOUS SURFACE TREATMENT

NOTES

1. FEATURE DESIGNATION DENOTES TYPE OF FEATURE, NUMBER O
FEATURE FOR GIVEN FEATURE TYPE AND TYPE OF TRAFFIC ARE
2. TRAFFIC AREA DESIGNATIONS ARE BASED ON AFM 88-6, CHAPT



TYPE OF FEATURE, NUMBER OF
PE AND TYPE OF TRAFFIC AREA.
E BASED ON AFM 88-6, CHAPTER 1.

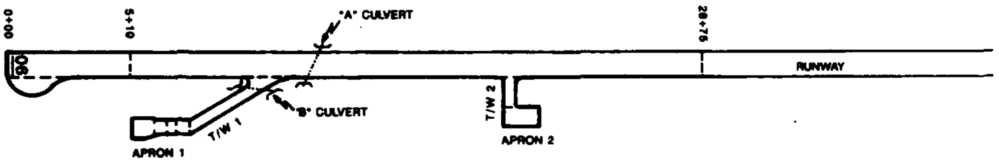


UNITED STATES AIR FORCE
ENGINEERING & SERVICES CENTER
TYNDALL AIR FORCE BASE, FLORIDA

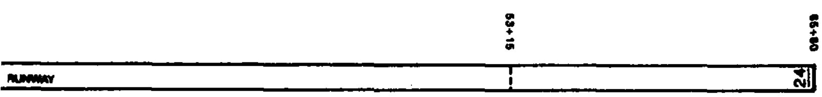
AIRFIELD LAYOUT PLAN

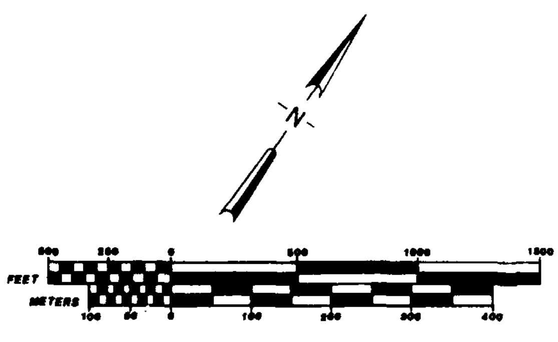
CAPITAN NICHOLAS ROJAS AIRPORT, (POTOSI) BOLIVIA

ENGINEER GABRIELSON	DATE AUGUST 89	DRAWING NUMBER APPENDIX A
DRAWN LaHUE	SCALE GRAPHIC	SHEET 1 OF 2



"A" CULVERT
0+00
5+10
28+76
RUNWAY
"B" CULVERT
T/W 1
T/W 2
APRON 1
APRON 2





UNITED STATES AIR FORCE
ENGINEERING & SERVICES CENTER
TYNDALL AIR FORCE BASE, FLORIDA

AIRFIELD DESIGNATIONS

CAPITAN NICHOLAS ROJAS AIRPORT, (POTOSI) BOLIVIA

ENGINEER	DATE	DRAWING NUMBER
GABRIELSON	AUGUST 89	APPENDIX A
DRAWN LeHUE	SCALE GRAPHIC	SHEET 2 OF 2

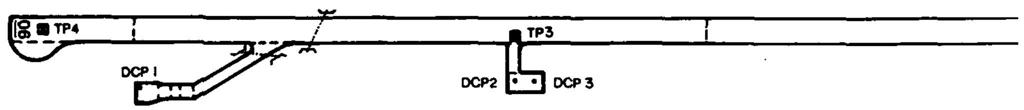
TEST PIT 4 (R1A)				
DEPTH (in)	MATERIAL SYMBOL	MATERIAL CLASSIF.	LL/PI (%)	CBR (%)
1				
		GP-GM (P2)	NP	37
12		SM (P2)	NP	75
27		SM (P2)	NP	100+**

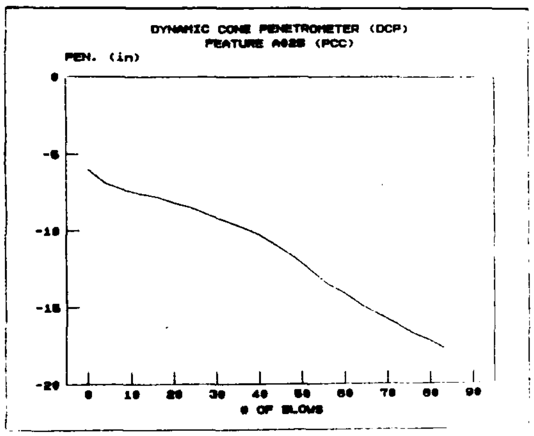
**Could not penetrate or excavate with back-hoe.

TEST PIT 3 (R2A)				
DEPTH (in)	MATERIAL SYMBOL	MATERIAL CLASSIF.	LL/PI (%)	CBR (%)
1				
		GC (P2)	28.6/ 17.4	55
7		SM (P2)	NP	70
31.5		SM (P2)	NP	13

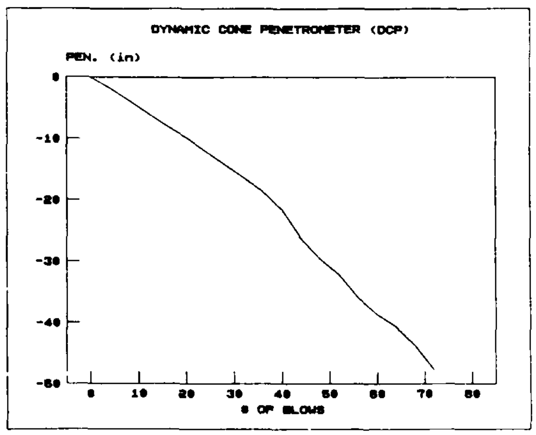
TEST PIT 2 (R3A			
DEPTH (in)	MATERIAL SYMBOL	MATERIAL CLASSIF.	LL/PI (%)
1			
		GC (P2)	28.6/ 17.4
17		GC (P2)	26.6/ 17.4
60*			

* Subgrade not encountered; CBR de by DCP.

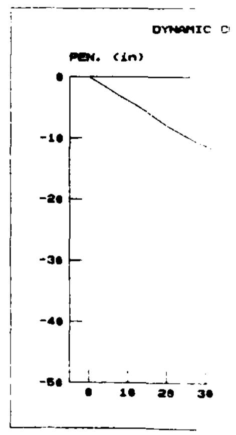




DCP 1



DCP 2



TEST PIT 2 (R3A)

DEPTH (in)	MATERIAL SYMBOL	CLASSIF.	LL/PI (%)	CBR (%)
1		GC (F2)	28.6/ 17.4	44
17		GC (F2)	26.6/ 17.4	47
60*				12

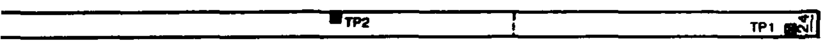
* Subgrade not encountered; CBR determined by DCP.

TEST PIT 1 (R4A)

DEPTH (in)	MATERIAL SYMBOL	CLASSIF.	LL/PI (%)	CBR (%)
1		GW-GM (F1)	NP	95
19		SM (F2)	NP	16
27		SC (F3)	33.3/ 16.6	8

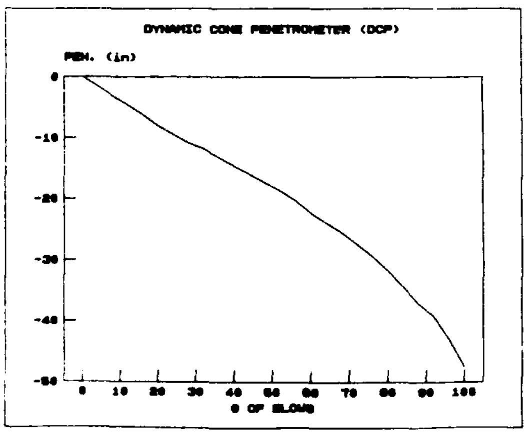
LEGEND

■ TP2	TEST PIT LOCATION AND NUMBER
GW-GM	WELL GRADED SILTY GRAVEL
GP-GM	POORLY GRADED SILTY GRAVEL
GC	CLAYEY GRAVEL
SM	SILTY SAND
SC	CLAYEY SAND
NP	NON-PLASTIC
SBST	SINGLE BITUMINOUS SURFACE TREATMENT
TBST	TRIPLE BITUMINOUS SURFACE TREATMENT



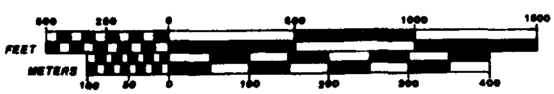
CORRELATION OF DCP VALUE TO CBR

DCP Inches/Blow	CBR %
0.1	80-120
0.2	50-79
0.3	37-49
0.4	26-36
0.5	22-25
0.6	18-21
0.7	15-17
0.8	13-14
0.9	11-12
1.0	10
1.1	9
1.2	8
1.3-1.4	7
1.5-1.6	6
1.7-1.9	5
2.0-2.2	4
2.3-2.9	3
3.0-4.0	2
4.1-5.0	1



DCP 3

N



UNITED STATES AIR FORCE
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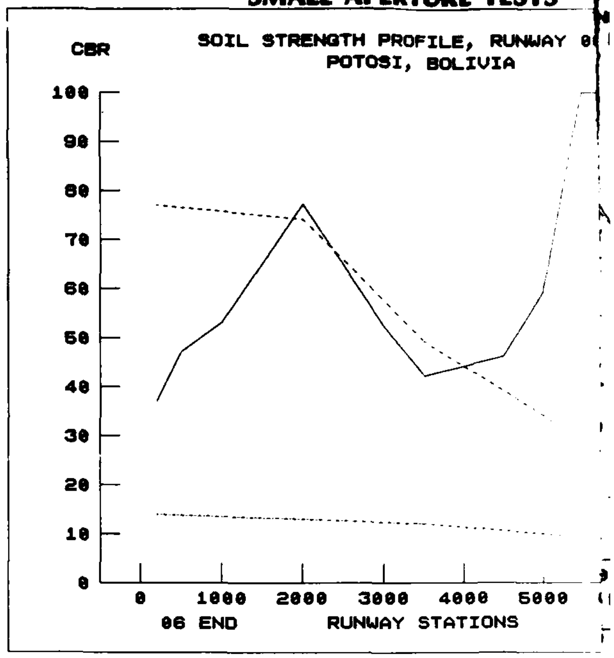
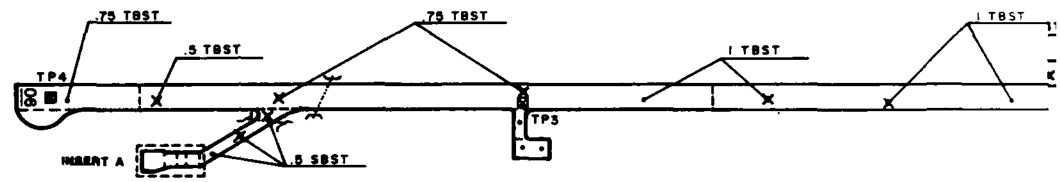
TEST PIT LOCATIONS

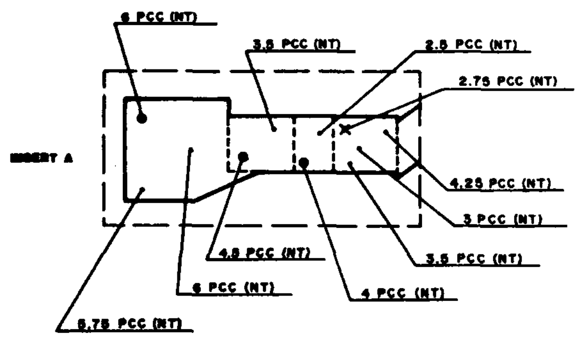
CAPITAN NICHOLAS ROJAS AIRPORT, (POTOSI) BOLIVIA

ENGINEER	DATE	DRAWING NUMBER
GABRIELSON	AUGUST 89	APPENDIX C
DRAWN LaHUE	SCALE GRAPHIC	SHEET 1 OF 2

SMALL APERTURE TESTS







LEGEND

TP2 — TEST PIT LOCATION AND NUMBER

1 TBST/6.5 PCC (NT) — CORE LOCATION, PAVEMENT THICKNESS IN INCHES, TYPE PAVEMENT, AND FLEXURAL STRENGTH OF CONCRETE FOR PCC CORES

X — SMALL APERTURE TEST LOCATION THROUGH CORE HOLE

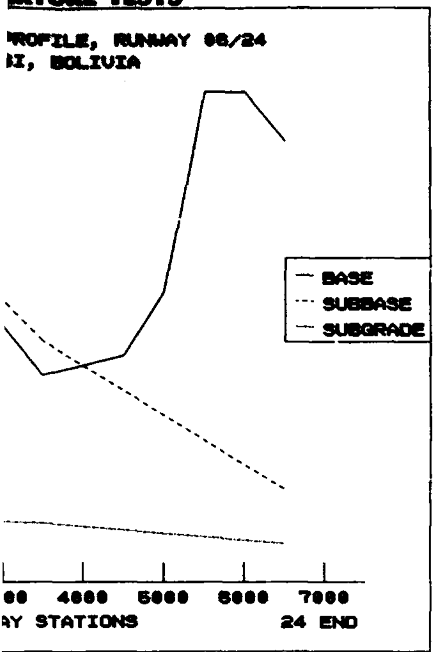
O — DYNAMIC CONE PENETROMETER (DCP) TEST LOCATION

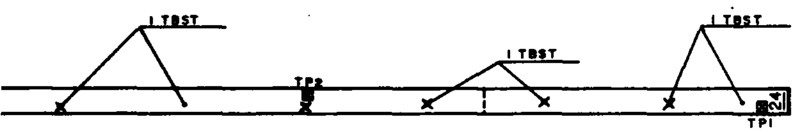
(NT) — NOT TESTED

SBST — SINGLE BITUMINOUS SURFACE TREATMENT

TBST — TRIPLE BITUMINOUS SURFACE TREATMENT

ERTURE TESTS





UMBER

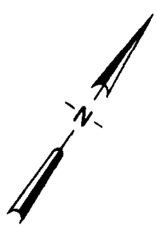
T THICKNESS IN INCHES,
URAL STRENGTH OF

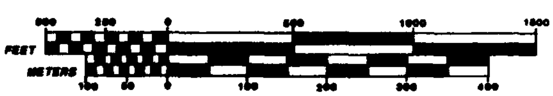
CATION THROUGH CORE HOLE

ETER (DCP) TEST LOCATION

CE TREATMENT

CE TREATMENT





UNITED STATES AIR FORCE
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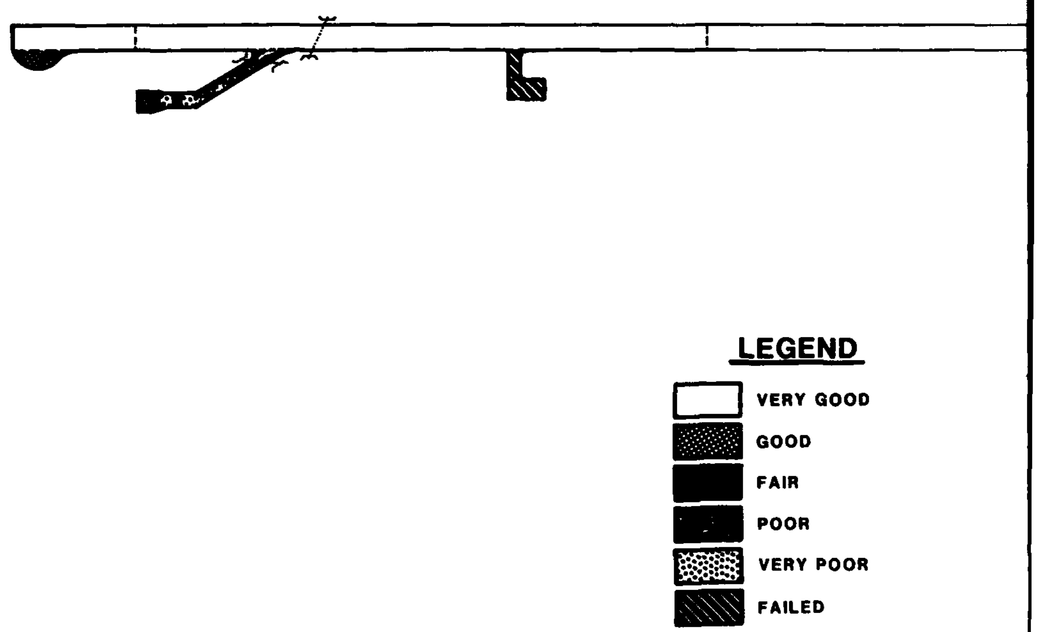
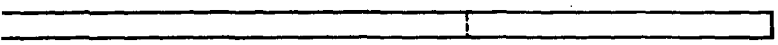
CORE LOCATIONS

CAPITAN NICHOLAS ROJAS AIRPORT, (POTOSI) BOLIVIA

ENGINEER GABRIELSON	DATE AUGUST 89	DRAWING NUMBER APPENDIX C
DRAWN LeHUE	SCALE GRAPHIC	SHEET 2 OF 2

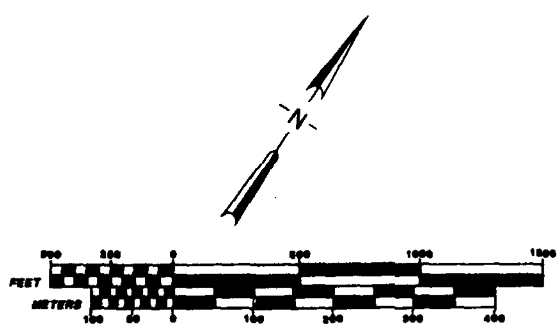

LEGEND
VERY GOOD
GOOD
FAIR
POOR
VERY POOR
FAILED



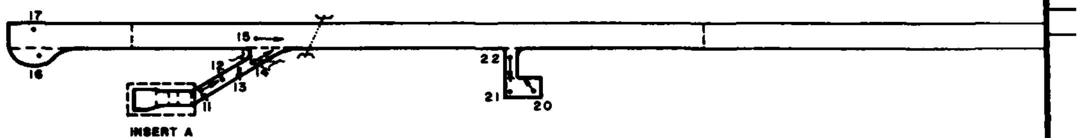
ID

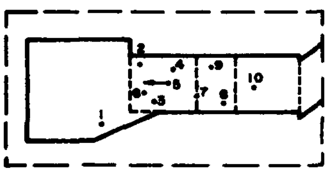
OOD

OOR



UNITED STATES AIR FORCE ENGINEERING & SERVICES CENTER TYNDALL AIR FORCE BASE, FLORIDA		
CONDITION SURVEY		
CAPITAN NICHOLAS ROJAS AIRPORT, (POTOSI) BOLIVIA		
ENGINEER GABRIELSON	DATE AUGUST 89	DRAWING NUMBER APPENDIX D
DRAWN LeHUE	SCALE GRAPHIC	SHEET 1 OF 4

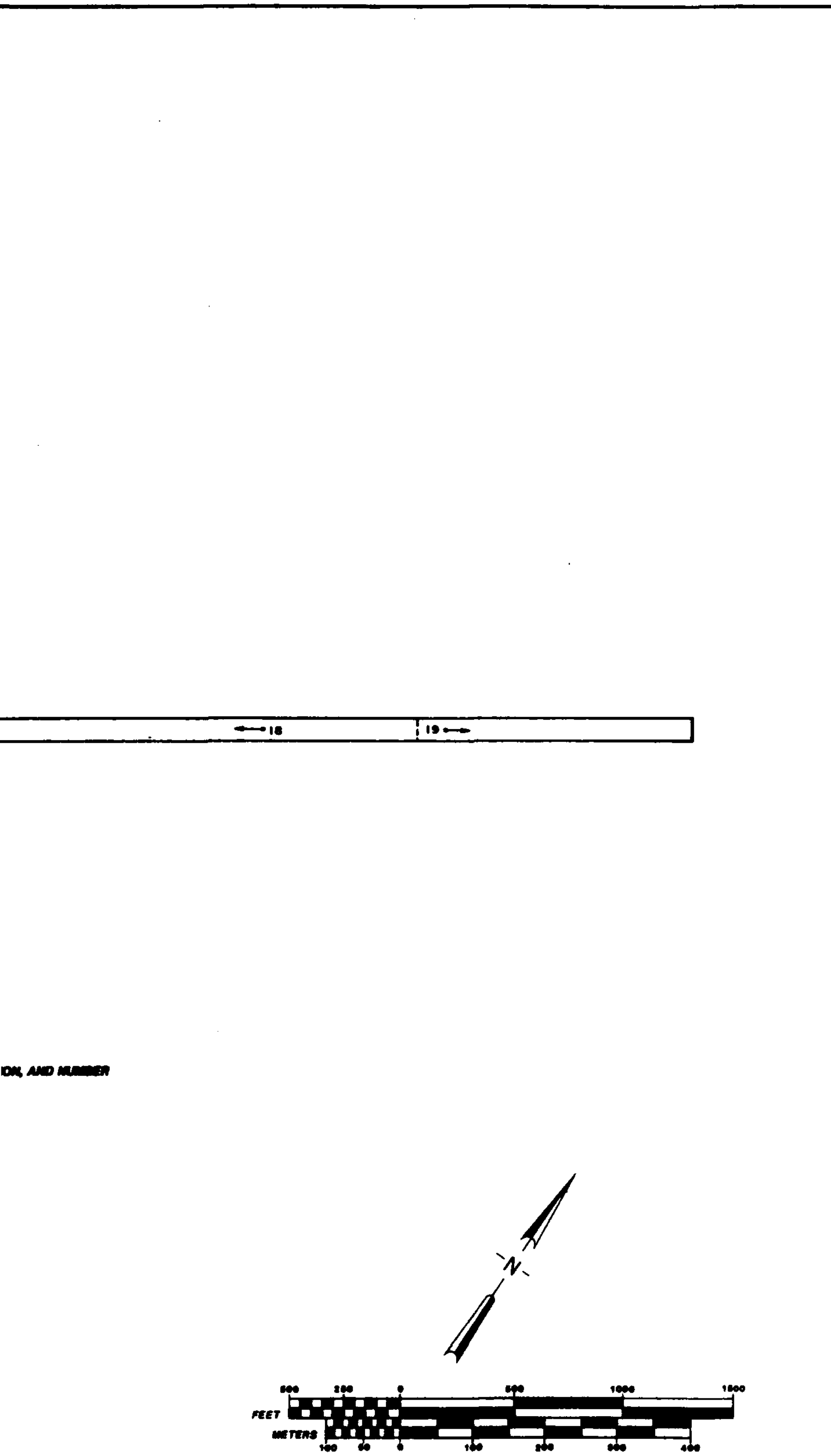




INSERT A

LEGEND

3 PHOTOGRAPH LOCATION, DIRECTION, AND NUMBER



UNITED STATES AIR FORCE
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PHOTOGRAPH LOCATIONS

CAPITAN NICHOLAS ROJAS AIRPORT, (POTOSI) BOLIVIA

ENGINEER	DATE	DRAWING NUMBER
GABRIELSON	AUGUST 89	APPENDIX D
DRAWN LaHUE	SCALE GRAPHIC	SHEET 2 OF 4

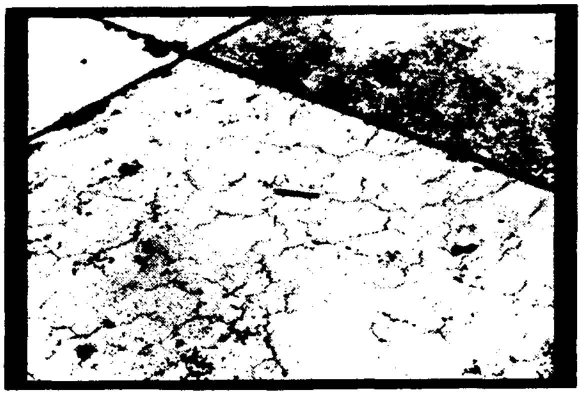


__PHOTO 1__: Map cracking typical on Feature A03B. This feature in best condition of all PCC features on the main apron.

__PHOTO 2__: Severe scaling patched with AC material. FOD and debris are scattered throughout.

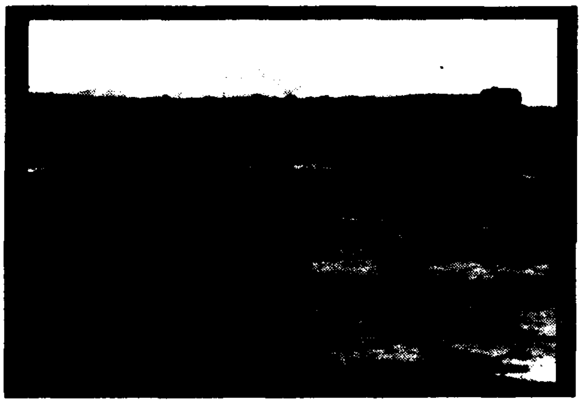


__PHOTO 5__: Longitudinal cracks patched with AC. Photo also depicts scaling typical on Features A03B-A04B.

__PHOTO 6__: Close-up of PCC core depicting minimal thickness (3 1/2"). PCC mix shows a concentration of fine aggregate.

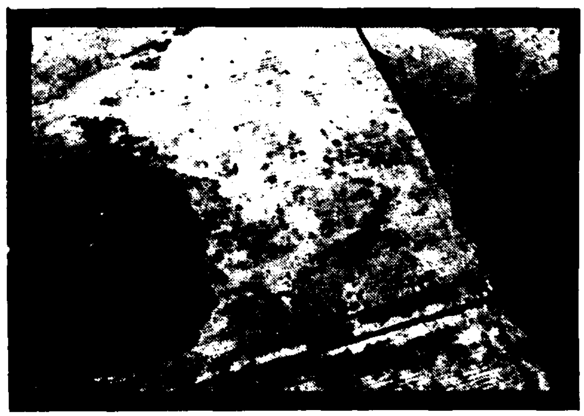


__PHOTO 10__: Map cracking and PCC scaling caused from excessive fine material near surface of pavement.

PHOTO 3: Offset transverse joints on adjacent lanes. Note that cracks are propagating from joints into adjacent concrete.

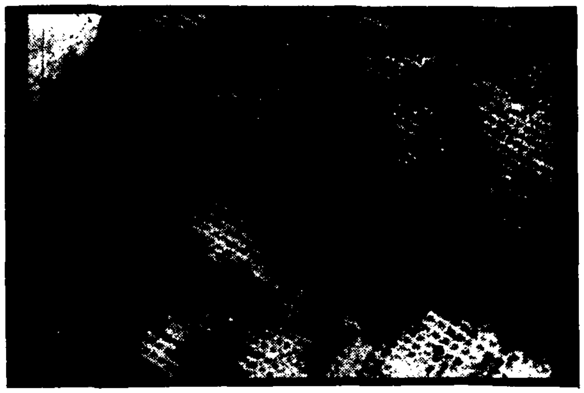


PHOTO 4: Close-up shot of the textured "waffle" finish on Features A03B-A04B.

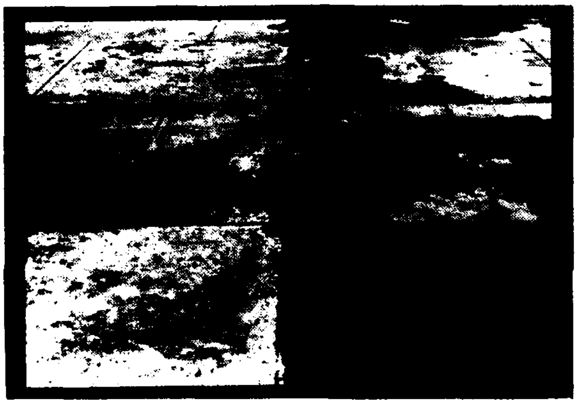
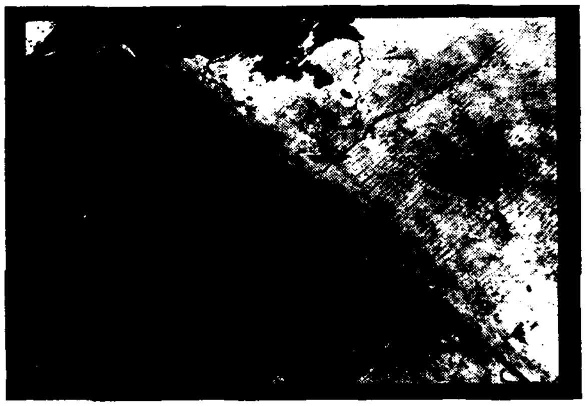


PHOTO 7: Spalled transverse joint between features with AC patch.



PHOTOS 8 & 9: Environmentally related D-Cracking and longitudinal joint cracking. Typical in Features A03B-A04B. Note offset transverse joints and lack of joint in Photo 9.

PHOTO 11: Apron access taxiway from the runway. Apron is constructed of Single Bituminous Surface Treatment on a 1" gravel cover of a cement stabilized base course.

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PHOTOGRAPHS

CAPITAN NICHOLAS ROJAS AIRPORT, (POTOSI) BOLIVIA

ENGINEER	DATE	DRAWING NUMBER
GABRIELSON	AUGUST [illegible]	APPENDIX D
DRAWN LaHUE	SCALE N/A	SHEET 2 OF 4

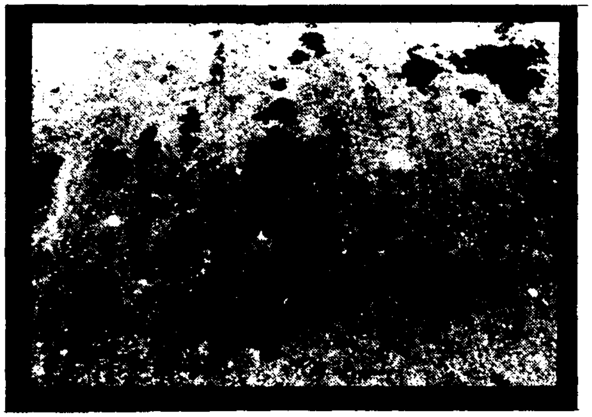
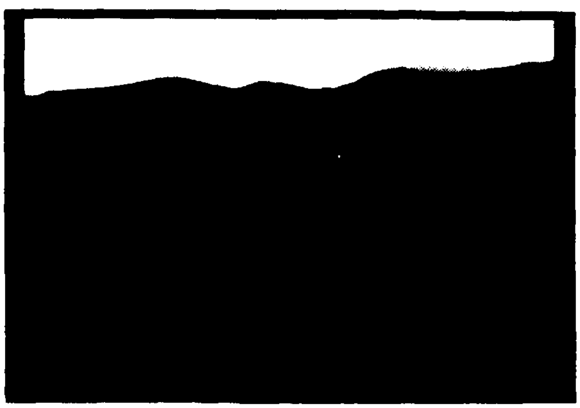


PHOTO 12: Separation of the asphalt surface treatment and underlying aggregate.

PHOTO 13: Evidence of fuel spills on the taxiway. Fuel caused a breakdown in the asphalt which led to separation of the asphalt and aggregate.

PHOTOS 16 & 17: Separation of top layer of Triple Bituminous Surface Treatment (TBST). May be caused from fuel spills, jet blast, or turning aircraft.



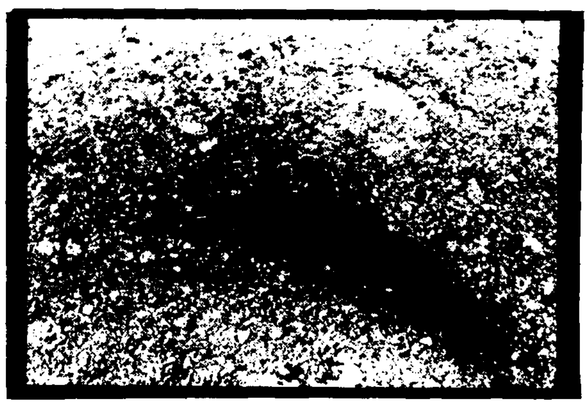


PHOTO 20: Parking Apron #2. Apron is not strong enough to support aircraft traffic. Originally constructed of a Single Bituminous Surface Treatment.

PHOTO 21: Depression made on Apron #2. Damage caused from engineer's boot.

PHOTO 14: Tire marks and minor rutting on access from taxiway to runway.

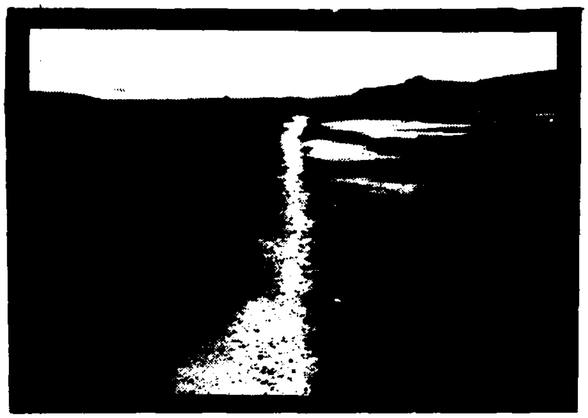


PHOTO 15: Intersection of taxiway and runway. FOD and debris are present. Recommend the area be swept clean of loose debris.

PHOTO 18: Runway 06/24 facing west.

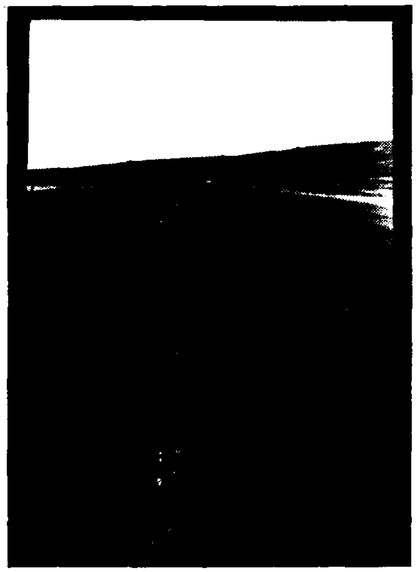


PHOTO 19: Runway 06/24 facing east. Note the top surface of the TBST has separated at the centerline.

on #2.
t.

PHOTO 22: Tire depressions left from one pass of backhoe on Apron #2.

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PHOTOGRAPHS

CAPITAN NICHOLAS ROJAS AIRPORT, (POTOSI) BOLIVIA

ENGINEER	DATE	DRAWING NUMBER
GABRIELSON	AUGUST 89	APPENDIX D
DRAWN: LaHUE	SCALE: N/A	SHEET 4 OF 4

POTOSI

SUMMARY OF PHYSICAL PROPERTY DATA																		
FACILITY					OVERLAY PAVEMENT			PAVEMENT			BASE			SUBBASE			SUBGRADE	
FEAT	IDENT	LGTH (ft)	WDTH (ft)	GEN COND	THICK (in)	DESCRP	1000E FLEX	THICK (in)	DESCRP	1000E FLEX	THICK (in)	DESCRP	1000E K/CBR	THICK (in)	DESCRP	1000E CBR	DESCRP	1000E K/CBR
R01A	RUNWAY 06/24 STA 0+00 -5+10	510	100	VERY GOOD			—	1.00	TRIPLE BITUMIN. SURFACE TREATMNT	—	11.00	GP-GM (F-2)	37	15.00	SM(F-2)	75	SM(F-2)	100+
R02A	RUNWAY 06/24 STA 5+10 -28+75	2365	100	VERY GOOD			—	1.00	TRIPLE BITUMIN. SURFACE TREATMNT	—	6.00	GC(F-2)	55	24.50	SM(F-2)	70	SM(F-2)	13
R03A	RUNWAY 06/24 STA 28+ 75-53+15	2440	100	VERY GOOD			—	1.00	TRIPLE BITUMIN. SURFACE TREATMNT	—	16.00	GC(F-2)	44	44.00	SM(F-2)	47	SM(F-2)	12
R04A	RUNWAY 06/24 STA 53+ 15-65+80	1265	100	VERY GOOD			—	1.00	TRIPLE BITUMIN. SURFACE TREATMNT	—	18.00	GW-GM (F-1)	95	18.00	SM(F-2)	16	SC(F-3)	8
T01A	TAXIWAY 1	465	50	POOR			—	0.50	SINGLE BITUMIN. SURFACE TREATMNT	—	6.00	CEMENT STABILZD BASE COURSE	100+			—	SM	3
T02C	TAXIWAY 2	135	45	FAILD			—	0.50	SINGLE BITUMIN. SURFACE TREATMNT	—	30.00	UNKNOWN	10			—	UNKNOWN	8
A01B	WARM-UP APRON	195	65	GOOD			—	1.00	TRIPLE BITUMIN. SURFACE TREATMNT	—	11.00	GP-GM (F-2)	37	15.00	SM(F-2)	75	SM(F-2)	100+
A02B	APRON 1	100	105	GOOD			—	6.00	PCC	450			—			—	UNKNOWN	400
A03B	APRON 1	55	130	VERY POOR			—	3.50	PCC	450			—			—	UNKNOWN	400
A04B	APRON 1	50	40	FAIR			—	3.00	PCC	450			—			—	UNKNOWN	400
A05B	APRON 2	175	115	FAILD			—	0.50	SINGLE BITUMIN. SURFACE TREATMNT	—	30.00	UNKNOWN	10			—	UNKNOWN	8

SUMMARY OF ALLOWABLE GROSS LOADS IN BRITISH UNITS

FEAT.	PASS INTENSITY LEVEL	PAVEMENT CAPACITY IN KIPS FOR AIRCRAFT GROUP INDEX NUMBERS												
		1	2	3	4	5	6	7	8	9	10	11	12	13
R01A	I	A	10	A	A	26	A	A	A	A	A	A	A	A
	II	A	10	A	A	26	A	A	A	A	A	A	A	A
	III	A	11	A	A	27	A	A	A	A	A	A	A	A
	IV	A	12	A	A	29	A	A	A	A	A	A	A	A
R02A	I	37	15	A	87	38	42	A	A	A	A	A	A	A
	II	38	15	A	88	39	43	A	A	A	A	A	A	A
	III	38	16	A	90	41	45	A	A	A	A	A	A	A
	IV	40	17	A	94	43	48	A	A	A	A	A	A	A
R03A	I	A	12	A	A	31	A	A	A	A	A	A	A	A
	II	A	12	A	A	31	A	A	A	A	A	A	A	A
	III	A	13	A	A	33	A	A	A	A	A	A	A	A
	IV	A	14	A	75	35	A	A	A	A	A	A	A	A
R04A	I	+	26	51	150	66	73	95	160	148	473	274	343	A
	II	+	27	52	152	68	75	97	162	150	474	280	350	A
	III	+	28	53	156	70	78	101	167	154	481	291	363	A
	IV	+	30	55	162	75	83	107	174	161	493	309	387	176
T01A	I	A	11	A	A	21	A	A	A	A	A	A	A	A
	II	A	13	A	A	24	A	A	A	A	A	A	A	A
	III	A	15	A	A	29	A	A	A	A	A	A	A	A
	IV	A	19	A	78	37	A	A	105	A	A	A	A	A
T02C	I	A	A	A	A	A	A	A	A	A	A	A	A	A
	II	A	A	A	A	A	A	A	A	A	A	A	A	A
	III	A	A	A	A	A	A	A	A	A	A	A	A	A
	IV	A	A	A	A	A	A	A	A	A	A	A	A	A
A01B	I	A	10	A	A	26	A	A	A	A	A	A	A	A
	II	A	11	A	A	27	A	A	A	A	A	A	A	A
	III	A	11	A	A	28	A	A	A	A	A	A	A	A
	IV	A	12	A	A	30	A	A	A	A	A	A	A	A
A02B	I	A	23	A	106	48	51	A	149	137	335	265	359	A
	II	38	30	A	124	56	60	A	172	157	399	334	450	A
	III	46	36	A	159	72	77	A	214	192	482	450	600	A
	IV	+	50	55	+	104	110	116	285	253	639	+	+	217
A03B	I	A	8	A	A	A	A	A	A	A	A	A	A	A
	II	A	10	A	A	21	A	A	A	A	A	A	A	A
	III	A	12	A	A	26	A	A	A	A	A	A	A	A
	IV	A	16	A	83	37	A	A	113	A	A	249	336	A
A04B	I	A	8	A	A	20	A	A	A	A	A	A	A	A
	II	A	10	A	A	23	A	A	A	A	A	A	A	A
	III	A	13	A	A	29	A	A	A	A	A	A	A	A
	IV	A	17	A	89	40	43	A	124	A	A	272	370	A
A05B	I	A	A	A	A	A	A	A	A	A	A	A	A	A
	II	A	A	A	A	A	A	A	A	A	A	A	A	A
	III	A	A	A	A	A	A	A	A	A	A	A	A	A
	IV	A	A	A	A	A	A	A	A	A	A	A	A	A

POTOSI

SUMMARY OF ALLOWABLE GROSS LOADS IN METRIC UNITS

FEAT.	PASS INTENSITY LEVEL	PAVEMENT CAPACITY IN KILOGRAMS x 1000 FOR AIRCRAFT GROUP INDEX NUMBERS												
		1	2	3	4	5	6	7	8	9	10	11	12	13
R01A	I	A	4	A	A	11	A	A	A	A	A	A	A	A
	II	A	4	A	A	11	A	A	A	A	A	A	A	A
	III	A	4	A	A	12	A	A	A	A	A	A	A	A
	IV	A	5	A	A	13	A	A	A	A	A	A	A	A
R02A	I	16	6	A	39	17	19	A	A	A	A	A	A	A
	II	17	6	A	39	17	19	A	A	A	A	A	A	A
	III	17	7	A	40	18	20	A	A	A	A	A	A	A
	IV	18	7	A	42	19	21	A	A	A	A	A	A	A
R03A	I	A	5	A	A	14	A	A	A	A	A	A	A	A
	II	A	5	A	A	14	A	A	A	A	A	A	A	A
	III	A	5	A	A	14	A	A	A	A	A	A	A	A
	IV	A	6	A	34	15	A	A	A	A	A	A	A	A
R04A	I	+	11	23	68	29	33	43	72	67	214	124	155	A
	II	+	12	23	69	30	34	44	73	68	215	127	158	A
	III	+	12	24	70	31	35	45	75	69	218	132	164	A
	IV	+	13	24	73	34	37	48	78	73	223	140	175	79
T01A	I	A	4	A	A	9	A	A	A	A	A	A	A	A
	II	A	5	A	A	10	A	A	A	A	A	A	A	A
	III	A	6	A	A	13	A	A	A	A	A	A	A	A
	IV	A	8	A	35	16	A	A	47	A	A	A	A	A
T02C	I	A	A	A	A	A	A	A	A	A	A	A	A	A
	II	A	A	A	A	A	A	A	A	A	A	A	A	A
	III	A	A	A	A	A	A	A	A	A	A	A	A	A
	IV	A	A	A	A	A	A	A	A	A	A	A	A	A
A01B	I	A	4	A	A	11	A	A	A	A	A	A	A	A
	II	A	4	A	A	12	A	A	A	A	A	A	A	A
	III	A	4	A	A	12	A	A	A	A	A	A	A	A
	IV	A	5	A	A	13	A	A	A	A	A	A	A	A
A02B	I	A	10	A	48	21	23	A	67	62	152	120	162	A
	II	17	13	A	56	25	27	A	79	71	176	151	204	A
	III	20	16	A	72	32	34	A	97	87	218	204	272	A
	IV	+	22	24	+	47	49	52	129	114	230	+	+	98
A03B	I	A	3	A	A	A	A	A	A	A	A	A	A	A
	II	A	4	A	A	9	A	A	A	A	A	A	A	A
	III	A	5	A	A	11	A	A	A	A	A	A	A	A
	IV	A	7	A	37	16	A	A	51	A	A	113	152	A
A04B	I	A	3	A	A	9	A	A	A	A	A	A	A	A
	II	A	4	A	A	10	A	A	A	A	A	A	A	A
	III	A	5	A	A	13	A	A	A	A	A	A	A	A
	IV	A	7	A	40	18	19	A	56	A	A	123	147	A
A05B	I	A	A	A	A	A	A	A	A	A	A	A	A	A
	II	A	A	A	A	A	A	A	A	A	A	A	A	A
	III	A	A	A	A	A	A	A	A	A	A	A	A	A
	IV	A	A	A	A	A	A	A	A	A	A	A	A	A

POTOSI

AIRCRAFT GROUP INDEX

LIGHT LOAD			MEDIUM LOAD							HEAVY LOAD		
1	2	3	4	5	6	7	8	9	10	11	12	13
A-37	A-7	*F-111	C-130	C-7	737	*727	707	C-141	C-5	*KC-10	747	B-52
C-12	A-10	FB-111		*C-9	*T-43	C-22	*E-3	*B-1		DC10	*E-4	
C-21	F-4			DC9..			C-135	B-757		L1011	VC-25	
*C-23	F-5			C-140			*KC-135			C-17		
T-37	*F-15						VC-137					
	F-16						DC-8					
	F-10X						EC-18					
	T-33						A-300					
	T-38						B-767					
	T-39											
	OV-10											
	C-20											

* CONTROLLING AIRCRAFT

GROSS WEIGHT LIMITS FOR AIRCRAFT GROUPS

	1	2	3	4	5	6	7	8	9	10	11	12	13
	PAVEMENT CAPACITY IN KIPS												
LOWEST POSSIBLE GROSS WEIGHT	5	7	49	69	22	61	92	60	150	325	240	334	180
HIGHEST POSSIBLE GROSS WEIGHT	25	81	114	175	121	125	210	400	477	840	590	850	488
	PAVEMENT CAPACITY IN KILOGRAMS x 1000												
LOWEST POSSIBLE GROSS WEIGHT	2	3	22	31	10	28	42	27	68	147	109	151	82
HIGHEST POSSIBLE GROSS WEIGHT	11	37	52	79	55	57	95	181	216	381	267	385	221

PASS INTENSITY LEVEL

LEVEL	1–3	4–10	11–13
I	300,000 PASSES	50,000 PASSES	15,000 PASSES
II	50,000 PASSES	15,000 PASSES	3,000 PASSES
III	15,000 PASSES	3,000 PASSES	500 PASSES
IV	3,000 PASSES	500 PASSES	100 PASSES

NOTES

IN REFERENCE TO THE ALLOWABLE GROSS LOAD (AGL) TABLE:

- *A Denotes lowest possible empty gross weight of any aircraft within the group exceeds the AGL of the pavement. Pavement cannot support aircraft for respective pass intensity level.*
- ** Denotes no weight restrictions. AGL of the pavement exceeds the greatest possible gross weight of any aircraft in the group.*

Pass intensity levels V and VI are used with reduced subgrade strengths to determine the maximum allowable loads during the frost-melt period.

UNITED STATES AIR FORCE
ENGINEERING & SERVICES CENTER
TYNDLL AIR FORCE BASE, FLORIDA

RELATED DATA

ENGINEER	DATE	DRAWING NUMBER
N/A	NOV 88	APPENDIX G
DRAWN: L. BASTIAN	SCALE: N/A	SHEET 1 OF ___

POTOSI, BOLIVIA

TOPOGRAPHY

Potosi lies in a northeast to southwest oriented valley in the high plateau region of Bolivia at 12,911 feet. The elevations around Potosi range from 15,472 ft in the north northeast to 16,174 ft in the northwest with the highest elevation being 16,503 ft just seven miles to the east southeast.

Several factors control the climate of Bolivia, giving the lowlands a very hot, wet and humid jungle type environment while the high plateau has a relatively cold, dry climate. With Potosi situated in a valley it has a very temperate climate. The South Atlantic high pressure cell is the source of the southeast trade winds which blow through Bolivia.

VISIBILITY

Visibility can be reduced below six miles due to fog, haze, or smoke on 17 days a year. Visibility will be reduced below two and a half miles only on two days a year and has never been reported below one half mile. Ceilings can be expected to be below 2000 ft on 101 days a year in the mornings during the summer months and will remain past noon only on 62 days.

SEVERE WEATHER

Thunderstorms occur on an average of 10 days a year with only four days having small hail. Snow is not uncommon in the high plateau area of Bolivia; however it usually melts soon after falling. Winds at Potosi average 10 - 15 knots during the winter months (May - September), and 10 kts during October - April. Potosi has 20 days a year when the winds will reach or exceed 28 kts.

CLIMATOLOGICAL DATA

	J	F	M	A	M	J	J	A	S	O	N	D	ANN	YRS REC
TEMPERATURE °F)														
HIGHEST	78	75	80	81	78	77	73	75	75	82	82	82	82	14
MEAN DAILY MAX	56	54	55	55	54	53	52	54	55	58	58	57	55	14
MEAN DAILY MIN	46	45	45	43	39	35	35	38	41	44	47	46	42	14
LOWEST	36	34	30	28	20	19	15	23	26	30	33	34	15	14
MEAN NO. OF DAYS														
MAX TEMP ≥ 90 °F	0	0	0	0	0	0	0	0	0	0	0	0	0	14
MIN TEMP ≤ 32 °F	0	0	#	#	6	13	12	8	2	#	0	0	41	14
PRECIPITATION														
MEAN (INCHES)	4.8	3.7	2.7	.4	.2	.2	.2	0	.3	.4	1.2	2.1	16.2	14
MEAN NO OF DAYS ≥ T	12	12	6	2	2	2	1	0	2	3	5	7	53	14
SNOWFALL														
MEAN (INCHES)	*	*	*	*	*	*	*	*	*	*	*	*	*	*
MEAN NO OF DAYS ≥ 6 IN	*	*	*	*	*	*	*	*	*	*	*	*	*	*
RELATIVE HUMIDITY (%)														
MEAN	66	66	64	53	50	49	51	52	47	47	51	60	54	14

MAXIMUM 24 HOUR PRECIPITATION

* INCHES * YEARS OF RECORD

MAXIMUM 24 HOUR SNOWFALL

* INCHES * YEARS OF RECORD

FLYING WEATHER - ANNUAL PERCENTAGES FOR VARIOUS CATEGORIES

A. CEILING ≥ 1000 FEET AND VISIBILITY ≥ 3 MILES	97.1 %
B. CEILING 500-900 FEET AND VISIBILITY ≥ 1 MILE, OR VISIBILITY ≥ 1 MILE BUT < 3 MILES AND CEILING ≥ 1000'	1.2 %
C. CEILING < 500 FEET AND/OR VISIBILITY < 1 MILE	1.7 %
D. INSTRUMENT: CEILING ≥ 200 FEET AND VISIBILITY ≥ 1/2 MILE, AND EITHER CEILING < 1500 FEET OR VISIBILITY < 3 MILES	7.3 %

SOURCE OF DATA DATSAV

NATIONAL INTELLIGENCE SURVEY (NIS)

T DENOTES LESS THAN .05 INCHES

* DENOTES DATA NOT AVAILABLE

ANNUAL WIND COVERAGE TABULATION

RUNWAYS OR COMBINATIONS FOR CROSSWIND COMPONENT 10 KNOTS OR LESS

RUNWAY DIAGRAM	MAGNETIC MARK	TRUE BEARING	LENGTH IN FEET	(1)	(2)
	06-24	02° W	7800	94.8	96.5

INSTRUMENT RUNWAY

(1) WIND COVERAGE (%) ALL WEATHER

(2) WIND COVERAGE (%) INSTRUMENT

ADDITIONAL DATA

FIELD ELEVATION 12,911 FEET MSL

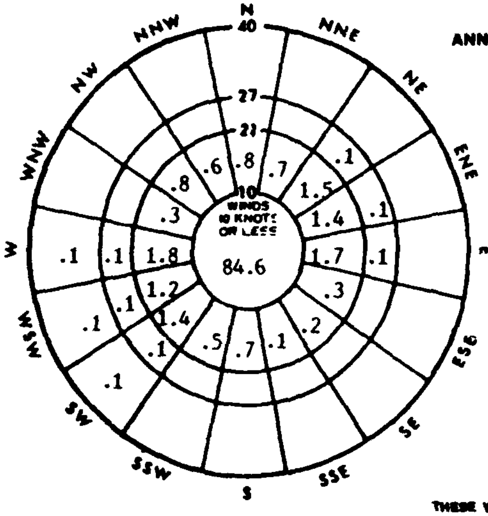
MAGNETIC VARIATION W 02°

SOURCE ONC

YEAR 1982

ALL RUNWAY DATA ARE ESTIMATED

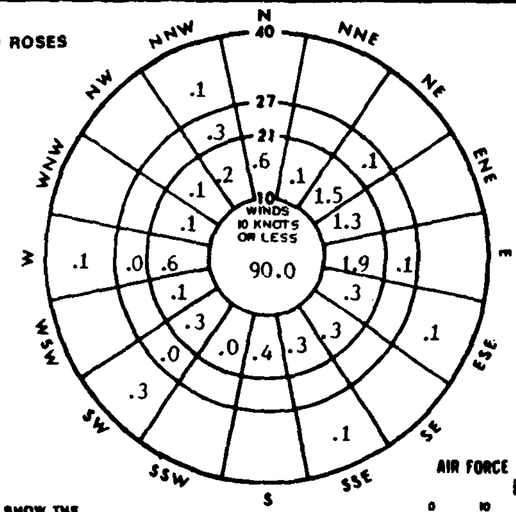
ANNUAL WIND ROSES



ALL WEATHER

NOTE:

THESE WIND ROSES SHOW THE TOTAL % OF WINDS BY SPEED GROUP AND DIRECTION BASED ON TRUE BEARING.



INSTRUMENT

ENGINEERING WEATHER DATA

AIR CONDITIONING DESIGN AND CRITERIA DATA (SEE AFM 88-8, CHAP 6)

WINTER HEATING DESIGN TEMPERATURE (SEE AFM 88-8, CHAP 6)

MEAN WINTER WIND SPEED 7.5 KNOTS

MEAN ANNUAL NUMBER OF HEATING DEGREE DAYS 6174 (SEE AFR 91-7

PRESSURE ALTITUDE AND TEMPERATURE DATA FOR DETERMINING REQUIRED RUNWAY LENGTHS (SEE AFM 86-2)

EXTREME WIND DATA FOR CONSTRUCTION DESIGN (SEE AFM 88-3, CHAP 1)

SNOW LOAD DATA FOR ROOF CONSTRUCTION (SEE AFM 88-3, CHAP 1)

MAXIMUM FROST PENETRATION (SEE AFM 88-3, CHAP 1)

MEAN ANNUAL COOLING DEGREE DAYS 0

NOTICE: WHEN NECESSARY, INTERPRETATIONS OF THESE DATA SHOULD BE SECURED THROUGH THE LOCAL STAFF WEATHER OFFICER

AIR FORCE RUNWAY WIND COMPUTER (SEE AFM 86-6)

KNOTS	0	10	21	27	40
MPH		12	24	31	46

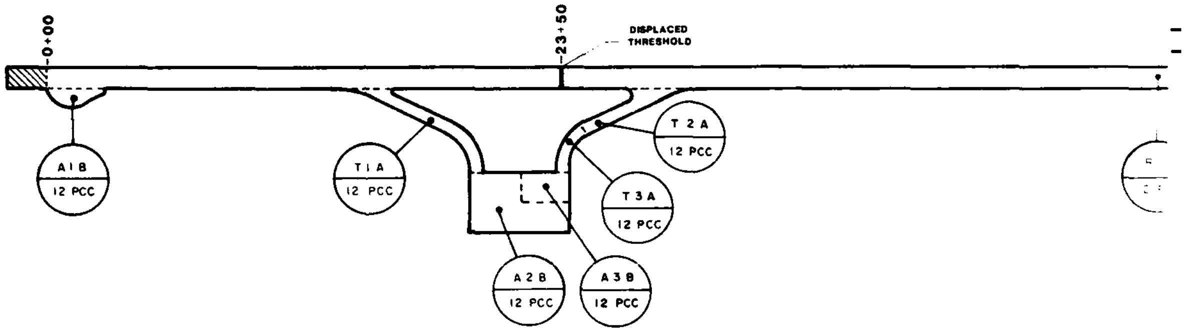
POTOSI, BOLIVIA
19° 32' S 065° 43' W
ELEVATION: 12,911
PREPARED BY USAFETAC
APRIL 1989

TAB [illegible]

USAFETAC Form 49 MAY 86

FORM REVISED 1 DEC [illegible]

SUCRE



LEGEND

R2A — FEATURE DESIGNATION (SEE NOTE 1)
13 PCC — PAVEMENT THICKNESS IN INCHES & TYPE

TYPE OF FEATURE

R — RUNWAY
T — TAXIWAY
A — APRON

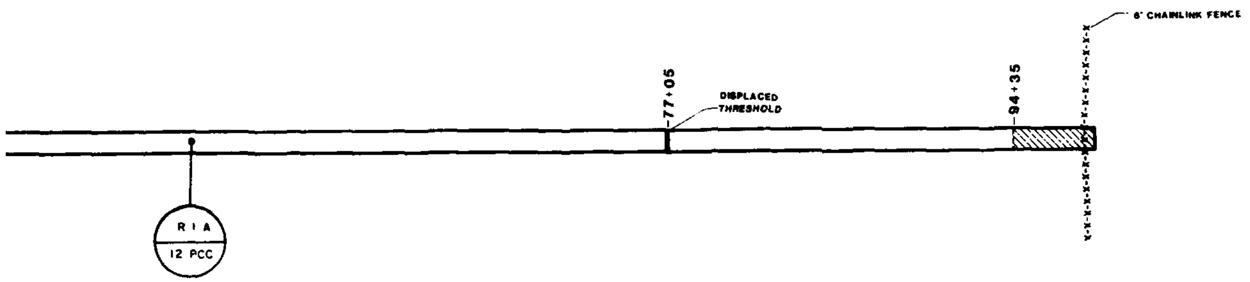
TYPE TRAFFIC AREA (SEE NOTE 2)

A — A TYPE TRAFFIC
B — B TYPE TRAFFIC
------ CHANGE IN FEATURE DESIGNATION
PCC PORTLAND CEMENT CONCRETE

NOT EVALUATED

N

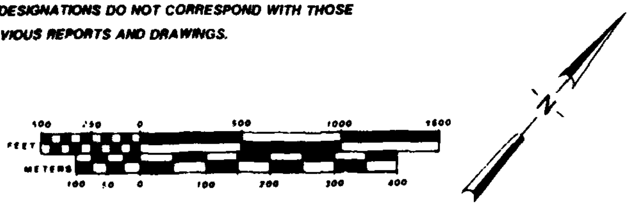
1. FEA
FE
2. TRA
3. FE
FRC



1)
TYPE

NOTES

1. FEATURE DESIGNATION DENOTES TYPE OF FEATURE, NUMBER OF FEATURE FOR GIVEN FEATURE TYPE AND TYPE TRAFFIC AREA.
2. TRAFFIC AREA DESIGNATIONS ARE BASED ON AFM 88 – 6, CHAPTER 1.
3. FEATURE DESIGNATIONS DO NOT CORRESPOND WITH THOSE FROM PREVIOUS REPORTS AND DRAWINGS.



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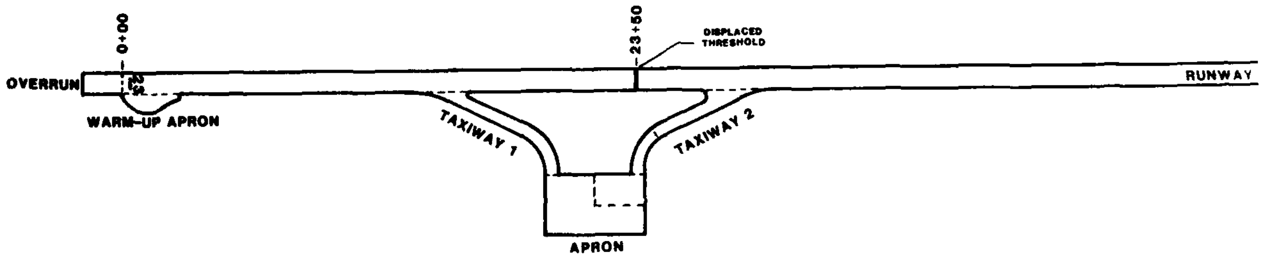
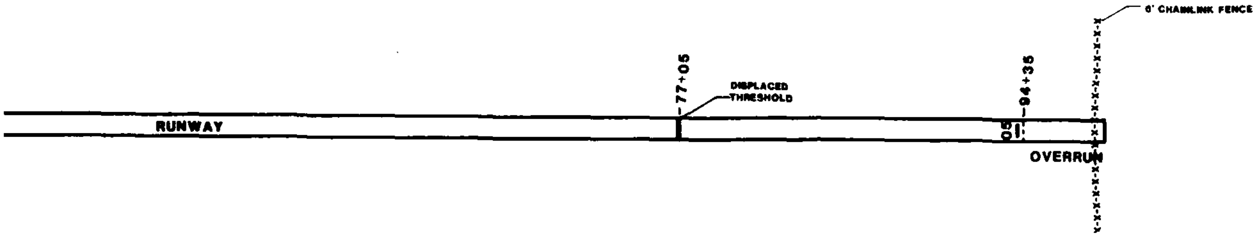
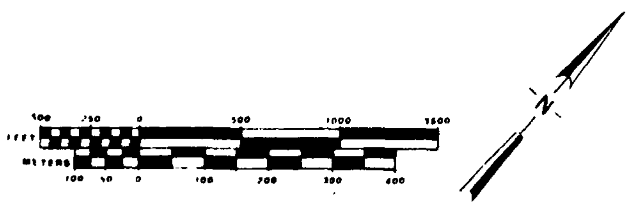
AIRFIELD LAYOUT PLAN

JUANA AZURDI DE PADILLA AIRPORT, (SUCRE) BOLIVIA

ENGINEER	DATE	DRAWING NUMBER
GABRIELSON	AUGUST 89	APPENDIX A
DRAWN	SCALE	
SANTIAGO	GRAPHI.	SHEET 1 OF 2


0+00
23+50
DISPLACED THRESHOLD
OVERRUN
RUNWAY
WARM-UP APRON
TAXIWAY 1
TAXIWAY 2
APRON





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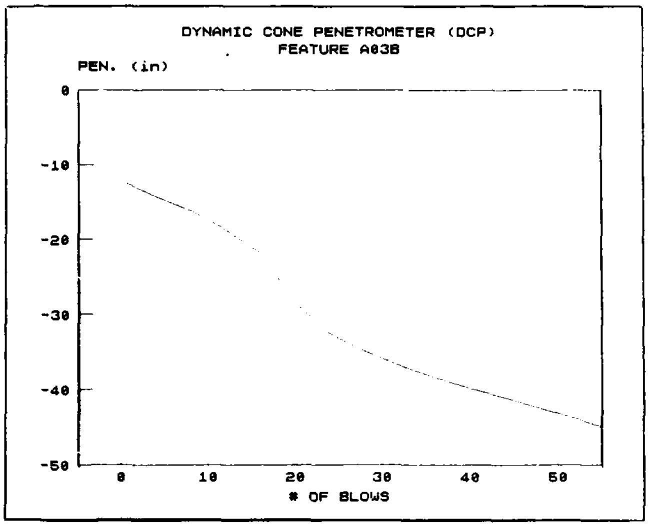
AIRFIELD DESIGNATIONS

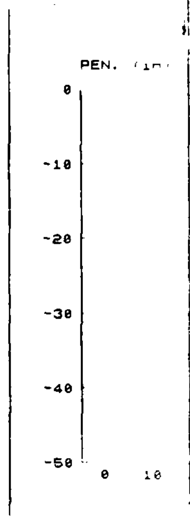
JUANA AZURDI DE PADILLA AIRPORT, (SUCRE) BOLIVIA

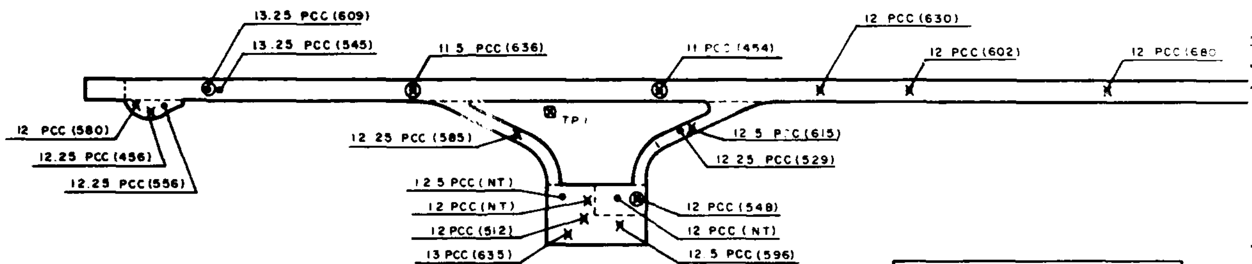
ENGINEER	DATE	DRAWING NUMBER
GABRIELSON	AUGUST 89	APPENDIX A
DRAWN	SCALE	
SANTIAGO	GRAPHIC	SHEET 2 OF 2

CORRELATION OF DCP VALUE TO CBR

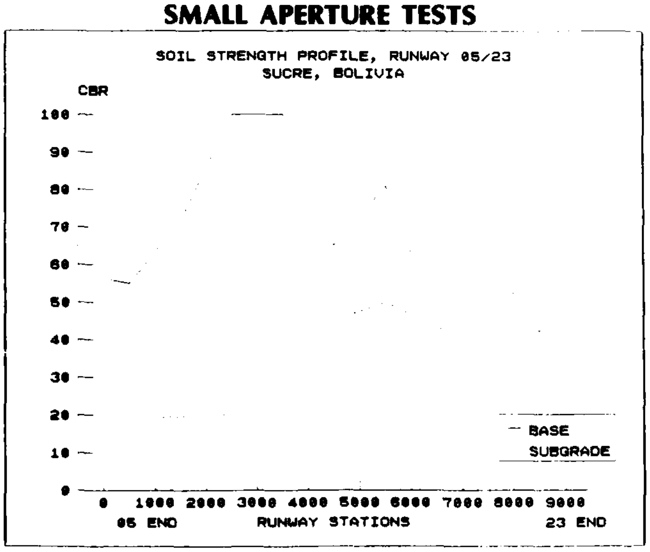
DCP Inches/Blow	CBR %
0.1	80-120
0.2	50-79
0.3	37-49
0.4	26-36
0.5	22-25
0.6	18-21
0.7	15-17
0.8	13-14
0.9	11-12
1.0	10
1.1	9
1.2	8
1.3-1.4	7
1.5-1.6	6
1.7-1.9	5
2.0-2.2	4
2.3-2.9	3
3.0-4.0	2
4.1-5.0	1







SMALL APERTURE TESTS

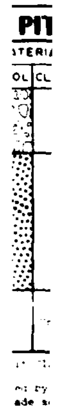


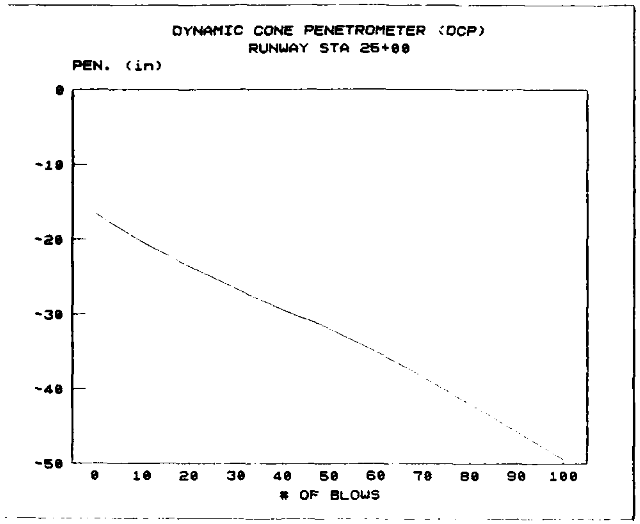
TEST PIT 1

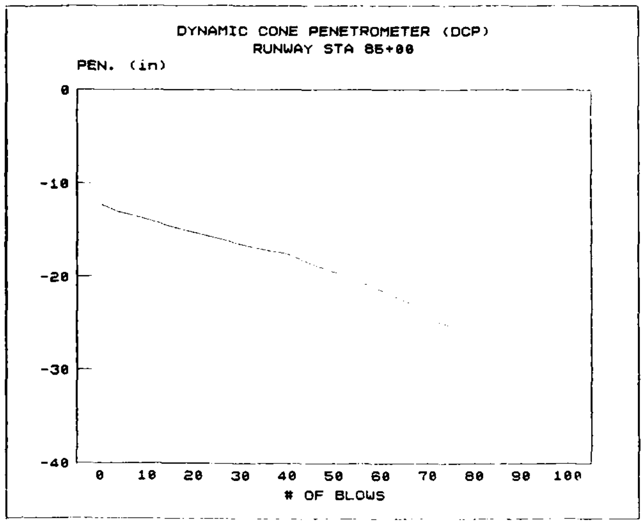
DEPTH (in)	MATERIAL SYMBOL	MATERIAL CLASSIF	LL/PI (%)	CBR (%)
12		PCC		
39		CL* (F2)	42.3/ 22.7	37
		Unknown**		2[illegible]

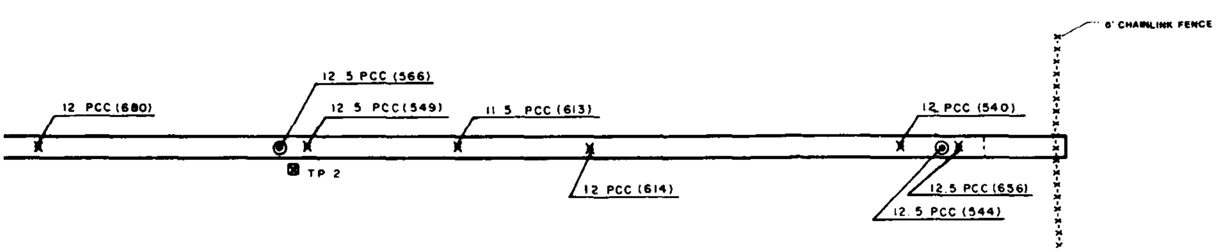
*Atterburg Limit Classified as "CL"

**CBR determined by Dynamic Cone Penetrometer (DCP), subgrade soil not recovered.









LL/PI (%)	CBR (%)
42.3/ 22.7	37
•	20

d as "CL"

Cone Penetrometer recovered.

TEST PIT 2

DEPTH (in)	MATERIAL SYMBOL	MATERIAL CLASSIF	LL/PI (%)	CBR (%)
		PCC		
12		SM-SC*	24.8/ 6.0	81
30		Unknown**		50

*Atterburg Limit Classified as "CL-ML"

** CBR determined by Dynamic Cone Penetrometer (DCP), subgrade soil not recovered.

LEGEND

TP2 — *TEST PIT LOCATION AND NUMBER*

7.5 AC/8.5 PCC (576) — *CORE LOCATION, PAVEMENT THICKNESS IN INCHES, TYPE PAVEMENT, AND FLEXURAL STRENGTH OF CONCRETE FOR PCC CORES.*

SMALL APERTURE TEST LOCATION THROUGH CORE HOLE

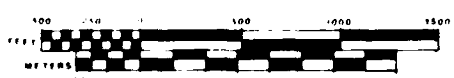
DYNAMIC CONE PENETROMETER (DCP) TEST LOCATION

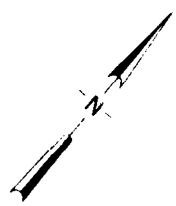
(NT) *NOT TESTED*

PCC *PORTLAND CEMENT CONCRETE*

GC *CLAYEY GRAVEL*

SM-SC *SILTY-CLAYEY SAND*



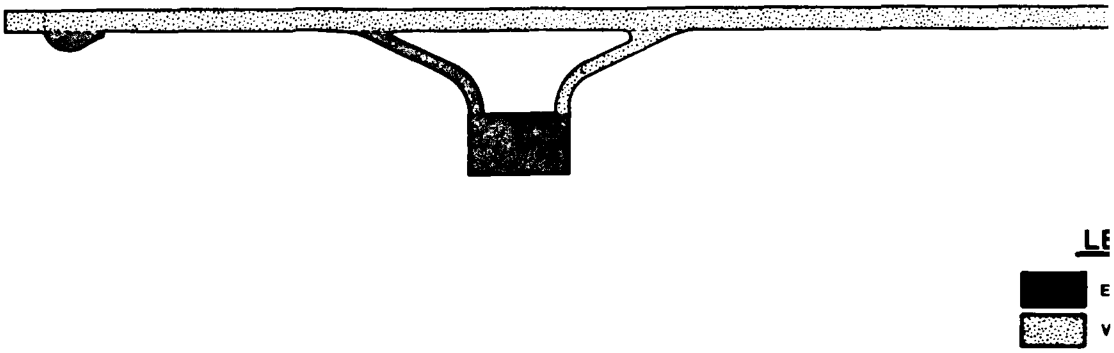


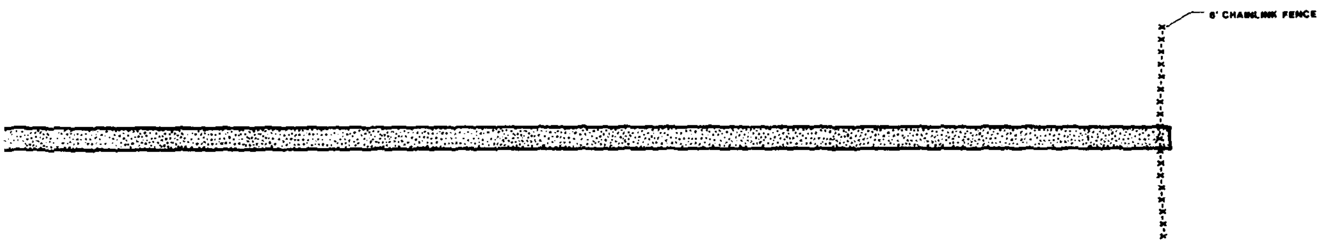
UNITED STATES AIR FORCE
ENGINEERING & SERVICES CENTER
TYNDALL AIR FORCE BASE, FLORIDA

FIELD TEST LOCATIONS

JUANA AZURDI DE PADILLA AIRPORT, (SUCRE) BOLIVIA

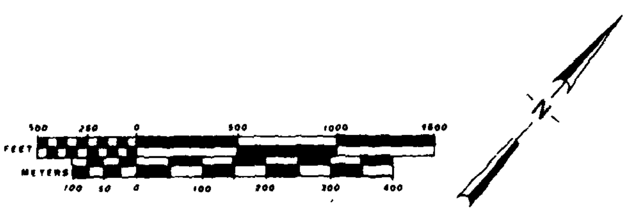
ENGINEER	DATE	DRAWING NUMBER
GABRIELSON	AUGUST 89	APPENDIX C
DRAWN: SANTIAGO	SCALE: GRAPHIC	SHEET 1 OF 1





LEGEND

- EXCELLENT
- VERY GOOD

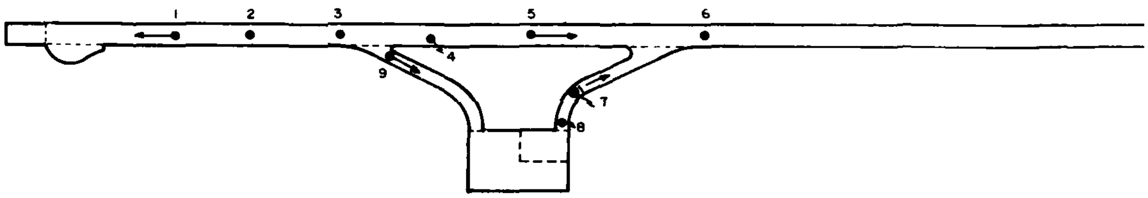


UNITED STATES AIR FORCE
ENGINEERING & SERVICES CENTER
TYNDALL AIR FORCE BASE, FLORIDA

CONDITION SURVEY

JUANA AZURDI DE PADILLA AIRPORT, (SUCRE) BOLIVIA

ENGINEER	DATE	DRAWING NUMBER
GABRIELSON	AUGUST 89	APPENDIX D
DRAWN SANTIAGO	SCALE GRAPHIC	SHEET 1 OF 3


1
2
3
4
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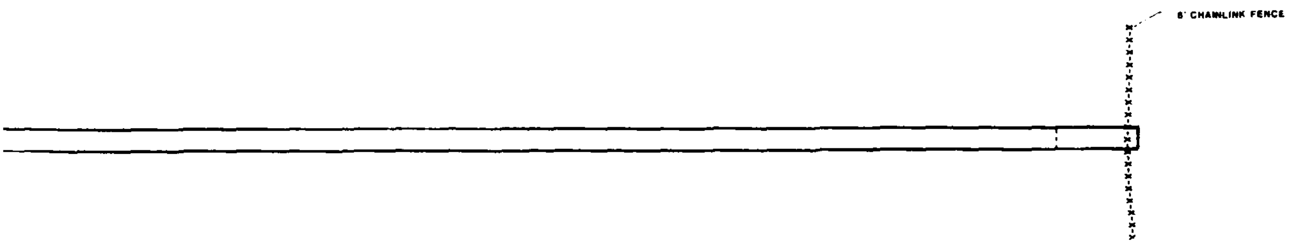
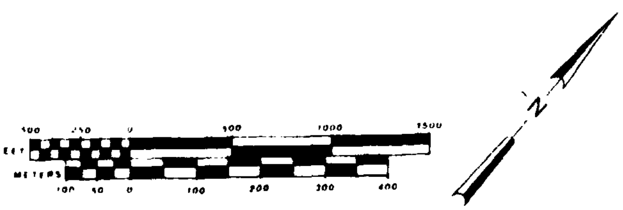
9



LEGEND

3 PHOTOGRAPH LOCATION, DIRECTION, AND NUMBER



UNITED STATES AIR FORCE ENGINEERING & SERVICES CENTER TYNDALL AIR FORCE BASE, FLORIDA		
PHOTOGRAPH LOCATIONS JUANA AZURDI DE PADILLA AIRPORT, (SUCRE) BOLIVIA		
ENGINEER GABRIELSON	DATE AUGUST 89	DRAWING NUMBER APPENDIX D
DRAWN SANTIAGO	SCALE GRAPHIC	SHEET 2 OF 3

PHOTO 1: 05 end of the runway showing hill which causes a steep glide slope for approaching aircraft.

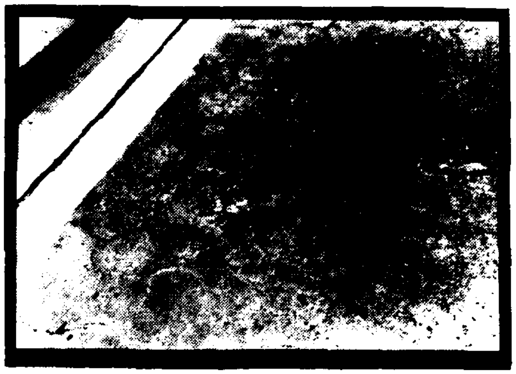


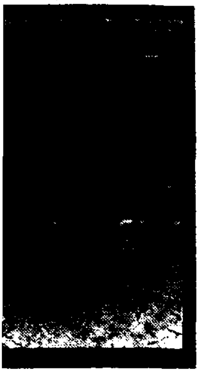
PHOTO 2: Low severity map cracking with alkali-aggregate reaction.

PHOTO 4: Longitudinal cracks that extend for six slabs. Cracks are located outside of the traffic areas and present no problem to aircraft. Cracks are well-maintained.

PHOTO 5: Runway 05/23, facing the 23 end. Photo is presented to depict the significant elevation drop of the 23 end of the runway.

PHOTO 7: Sealed longitudinal crack on Feature T02A.

PHOTOS 8: Load related cracks that have been well maintained. Traffic is concentrated in this area.



cracking with

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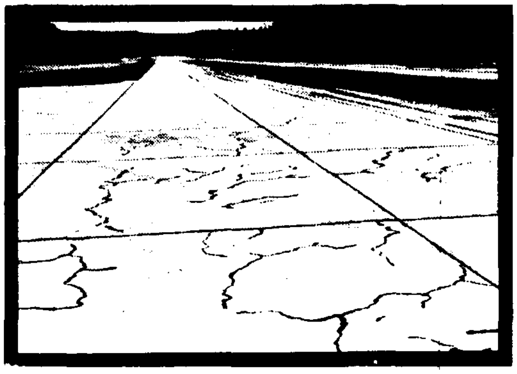


PHOTO 3: Typical PCC map cracks that were chipped to sound material and sealed.

PHOTO 6: Typical low severity crack that was chipped to sound material, but not sealed.

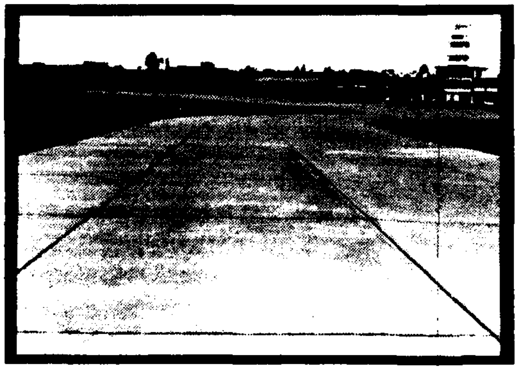


PHOTO 9: Excellent condition PCC typical of many pavements throughout the airfield.

UNITED STATES AIR FORCE ENGINEERING & SERVICES CENTER TYNDALL AIR FORCE BASE, FLORIDA		
PHOTOGRAPHS JUANA AZURDI DE PADILLA, (SUCRE) BOLIVIA		
ENGINEER GABRIELSON	DATE AUGUST 89	DRAWING NUMBER APPENDIX D
DRAWN SANTIAGO	SCALE N/A	SHEET 3 OF 3

SUCRE

SUMMARY OF PHYSICAL PROPERTY DATA																		
FACILITY					OVERLAY PAVEMENT			PAVEMENT			BASE			SUBBASE			SUBGRADE	
FEAT	IDENT	LGTH (ft)	WDTH (ft)	GEN COND	THICK (in)	DESCRP	1000E FLEX	THICK (in)	DESCRP	1000E FLEX	THICK (in)	DESCRP	1000E K/CBR	THICK (in)	DESCRP	1000E CBR	DESCRP	1000E K/CBR
R01A	RUNWAY 05/23 STA 0+00 -94+35	9435	100	VERY GOOD			—	12.00	PCC	— 590	27.00	GC(F-2)	— 300			—		—
T01A	TAXIWAY 1	800	50	VERY GOOD			—	12.00	PCC	— 585	28.00	SM(F-3)	— 250			—		—
T02A	TAXIWAY 2	200	50	EXCEL			—	12.00	PCC	— 570	8.00	SM(F-3)	— 20C			—		—
T03A	TAXIWAY 2	600	50	EXCEL			—	12.00	PCC	— 570		SM(F-3)	— 300			—		—
A01B	WARM-UP APRON	300	100	EXCEL			—	12.00	PCC	— 530	28.00	SM(F-3)	— 300			—		—
A02B	MAIN APRON	400	250	EXCEL			—	12.00	PCC	— 580		SM(F-3)	— 300			—		—
A03B	MAIN APRON	200	150	EXCEL			—	12.00	PCC	— 550	8.00	SM(F-3)	— 200			—		—

SUMMARY OF ALLOWABLE GROSS LOADS IN BRITISH UNITS														
FEAT.	PASS INTENSITY LEVEL	PAVEMENT CAPACITY IN KIPS FOR AIRCRAFT GROUP INDEX NUMBERS												
		1	2	3	4	5	6	7	8	9	10	11	12	13
R01A	I	+	+	78	+	+	137	145	+	307	+	+	+	255
	II	+	+	98	+	+	+	170	+	347	+	+	+	309
	III	+	+	116	+	+	+	+	+	412	+	+	+	394
	IV	+	+	+	+	+	+	+	+	+	+	+	+	+
T01A	I	+	67	72	+	+	126	133	315	280	+	572	773	233
	II	+	+	91	+	+	147	156	+	315	+	+	+	281
	III	+	+	107	+	+	+	+	+	371	+	+	+	351
	IV	+	+	+	+	+	+	+	+	462	+	+	+	450
T02A	I	+	61	66	+	107	113	120	279	248	716	506	683	208
	II	+	+	82	+	+	131	139	315	278	+	585	+	249
	III	+	+	96	+	+	+	168	+	374	+	+	+	307
	IV	+	+	119	+	+	+	+	+	398	+	+	+	385
T03A	I	+	+	75	+	+	132	140	+	297	+	+	+	246
	II	+	+	95	+	+	+	164	+	335	+	+	+	299
	III	+	+	112	+	+	+	+	+	398	+	+	+	380
	IV	+	+	+	+	+	+	+	+	+	+	+	+	+
A01B	I	+	+	76	+	+	133	141	+	293	+	+	+	234
	II	+	+	97	+	+	+	165	+	331	+	+	+	285
	III	+	+	115	+	+	+	+	+	390	+	+	+	365
	IV	+	+	+	+	+	+	+	+	+	+	+	+	482
A02B	I	+	+	83	+	+	146	154	+	321	+	+	+	256
	II	+	+	107	+	+	+	+	+	362	+	+	+	312
	III	+	+	+	+	+	+	+	+	437	+	+	+	390
	IV	+	+	+	+	+	+	+	+	+	+	+	+	+
A03B	I	+	63	69	+	+	118	125	287	253	711	509	683	205
	II	+	+	87	+	+	130	144	320	283	+	+	+	245
	III	+	+	101	+	+	+	+	+	334	+	+	+	304
	IV	+	+	+	+	+	+	+	+	410	+	+	+	384

SUCRE

NOTES

IN REFERENCE TO THE ALLOWABLE GROSS LOAD (AGL) TABLE:

- ***A*** *Denotes lowest possible empty gross weight of any aircraft within the group exceeds the AGL of the pavement. Pavement cannot support aircraft for respective pass intensity level.*

- ***+*** *Denotes no weight restrictions. AGL of the pavement exceeds the greatest possible gross weight of any aircraft in the group.*

The load carrying capacities of the pavements reported herein are based on material properties representative of the in-place conditions at the time this field investigation was conducted.

SUMMARY OF ALLOWABLE GROSS LOADS IN METRIC UNITS

FEAT.	PASS INTENSITY LEVEL	PAVEMENT CAPACITY IN KILOGRAMS x 1000 FOR AIRCRAFT GROUP INDEX NUMBERS												
		1	2	3	4	5	6	7	8	9	10	11	12	13
R01A	I	+	+	35	+	+	62	65	+	139	+	+	+	115
	II	+	+	44	+	+	+	77	+	157	+	+	+	140
	III	+	+	52	+	+	+	+	+	187	+	+	+	178
	IV	+	+	+	+	+	+	+	+	+	+	+	+	+
T01A	I	+	30	32	+	+	57	60	143	127	+	259	350	105
	II	+	+	41	+	+	66	70	+	143	+	+	+	127
	III	+	+	48	+	+	+	+	+	168	+	+	+	159
	IV	+	+	+	+	+	+	+	+	209	+	+	+	204
T02A	I	+	27	29	+	48	52	54	126	112	325	229	310	94
	II	+	+	37	+	+	59	63	143	126	+	265	+	113
	III	+	+	43	+	+	+	76	+	147	+	+	+	139
	IV	+	+	54	+	+	+	+	+	180	+	+	+	174
T03A	I	+	+	34	+	+	59	63	+	134	+	+	+	111
	II	+	+	43	+	+	+	74	+	152	+	+	+	135
	III	+	+	50	+	+	+	+	+	180	+	+	+	172
	IV	+	+	+	+	+	+	+	+	+	+	+	+	+
A01B	I	+	+	34	+	+	60	64	+	133	+	+	+	106
	II	+	+	44	+	+	+	74	+	150	+	+	+	129
	III	+	+	52	+	+	+	+	+	181	+	+	+	165
	IV	+	+	+	+	+	+	+	+	+	+	+	+	218
A02B	I	+	+	37	+	+	66	69	+	145	+	+	+	116
	II	+	+	48	+	+	+	+	+	164	+	+	+	141
	III	+	+	+	+	+	+	+	+	198	+	+	+	181
	IV	+	+	+	+	+	+	+	+	+	+	+	+	+
A03B	I	+	28	31	+	+	53	56	130	114	322	231	310	93
	II	+	+	39	+	+	61	65	145	128	+	+	+	111
	III	+	+	45	+	+	+	+	+	151	+	+	+	138
	IV	+	+	+	+	+	+	+	+	190	+	+	+	174

SUCRE

NOTES

IN REFERENCE TO THE ALLOWABLE GROSS LOAD (AGL) TABLE:

- **A** Denotes lowest possible empty gross weight of any aircraft within the group exceeds the AGL of the pavement. Pavement cannot support aircraft for respective pass intensity level.

- **+** Denotes no weight restrictions. AGL of the pavement exceeds the greatest possible gross weight of any aircraft in the group.

The load carrying capacities of the pavements reported herein are based on material properties representative of the in-place conditions at the time this field investigation was conducted.

AIRCRAFT GROUP INDEX

LIGHT LOAD			MEDIUM LOAD							HEAVY LOAD		
1	2	3	4	5	6	7	8	9	10	11	12	13
A-37 C-12 C-21 *C-23 T-37	A-7 A-10 F-4 F-5 *F-15 F-16 F-10X T-33 T-38 T-39 OV-10 C-20	*F-111 FB-111	C-130	C-7 *C-9 DC9 C-140	737 *T-43	*727 C-22	707 *E-3 C-135 *KC-135 VC-137 DC-8 EC-18 A-300 B-767	C-141 *B-1 B-757	C-5	*KC-10 DC10 L1011 C-17	747 *E-4 VC-25	B-52

* CONTROLLING AIRCRAFT

GROSS WEIGHT LIMITS FOR AIRCRAFT GROUPS

	1	2	3	4	5	6	7	8	9	10	11	12	13
	PAVEMENT CAPACITY IN KIPS												
LOWEST POSSIBLE GROSS WEIGHT	5	7	49	69	22	61	92	60	150	325	240	334	180
HIGHEST POSSIBLE GROSS WEIGHT	25	81	114	175	121	125	210	400	477	840	590	850	486
	PAVEMENT CAPACITY IN KILOGRAMS x 1000												
LOWEST POSSIBLE GROSS WEIGHT	2	3	22	31	10	28	42	27	68	147	109	151	82
HIGHEST POSSIBLE GROSS WEIGHT	11	37	52	79	55	57	95	181	216	381	267	385	221

PASS INTENSITY LEVEL

LEVEL	1 – 3	4 – 10	11 – 13
I	300,000 PASSES	50,000 PASSES	15,000 PASSES
II	50,000 PASSES	15,000 PASSES	3,000 PASSES
III	15,000 PASSES	3,000 PASSES	500 PASSES
IV	3,000 PASSES	500 PASSES	100 PASSES

NOTES

IN REFERENCE TO THE ALLOWABLE GROSS LOAD (AGL) TABLE:

- *A* *Denotes lowest possible empty gross weight of any aircraft within the group exceeds the AGL of the pavement. Pavement cannot support aircraft for respective pass intensity level.*
- *◆* *Denotes no weight restrictions. AGL of the pavement exceeds the greatest possible gross weight of any aircraft in the group.*

Pass intensity levels V and VI are used with reduced subgrade strengths to determine the maximum allowable loads during the frost-melt period.

UNITED STATES AIR FORCE
ENGINEERING & SERVICES CENTER
TYNDLL AIR FORCE BASE, FLORIDA

RELATED DATA

ENGINEER	DATE	DRAWING NUMBER
N/A	NOV 88	APPENDIX G
DRAWN	SCALE	
L. BASTIAN	N/A	SHEET 1 OF ___

SUCRE, BOLIVIA

TOPOGRAPHY

Sucre is located at 9500 feet at the head of a short, narrow North through South oriented valley on the Bolivian high plateau. There are mountains on three sides of Sucre, ranging from a maximum of 16,000 feet 30 miles Southwest through West to a more modest 11,000 - 13,000 feet 40 miles to the West through Northeast. There is a break from the Northeast through Southeast with lower elevations with 9,000 - 10,000 foot peaks. From 40 miles to the Southeast through the Southwest there are peaks of 11,000 - 13,000 feet.

VISIBILITY

Visibility restrictions are not a real problem, with fog, haze and smoke reducing visibilities below 6 miles only 17 days annually. Visibilities less than 2 1/2 miles occur 4 days a year and visibilities of less than 5/8 of a mile only 2 days a year. The restrictions to visibility occur mainly in the late summer months.

SEVERE WEATHER

Thunderstorms will occur 16 days annually with 7 of those days having small pea-sized hail. Snow rarely falls; however, when it does fall it melts almost immediately upon contact with the warm ground. The peak wind available is 50 knots from the North.

CLIMATOLOGICAL DATA

	J	F	M	A	M	J	J	A	S	O	N	D	ANN	YRS REC
TEMPERATURE (°F)														
HIGHEST	91	89	87	88	91	86	86	88	89	83	93	84	93	14
MEAN DAILY MAX	67	66	66	67	68	66	66	67	68	69	69	68	67	14
MEAN DAILY MIN	55	54	54	52	50	46	46	48	50	54	55	55	50	14
LOWEST	21	41	41	24	28	28	28	36	32	26	26	41	21	14
MEAN NO OF DAYS														
MAX TEMP ≥ 90 °F	0.1	0	0	0	0.1	0	0	0	0.1	0.1	0	0	0	14
MIN TEMP ≤ 32 °F	0.1	0.1	0	0	0.1	0.2	0.6	0.4	0.1	0	0	0	0.1	14
PRECIPITATION														
MEAN (INCHES)	7.3	4.9	3.7	1.6	0.2	0.1	0.2	0.3	1.0	1.6	2.6	4.3	27.8	52
MEAN NO OF DAYS ≥ T	16	14	9	4	1	1	1	2	5	5	8	12	78	5
SNOWFALL														
MEAN (INCHES)	*	*	*	*	*	*	*	*	*	*	*	*	*	*
MEAN NO OF DAYS ≥ 6 IN	*	*	*	*	*	*	*	*	*	*	*	*	*	*
RELATIVE HUMIDITY (%)														
MEAN	68.6	70.9	69	62	46.2	41.1	41.2	46	49.4	52.4	55.8	63.1	55.3	14

MAXIMUM 24 HOUR PRECIPITATION

2.20 INCHES 6** YEARS OF RECORD

MAXIMUM 24 HOUR SNOWFALL

* INCHES ____ YEARS OF RECORD

FLYING WEATHER ANNUAL PERCENTAGES FOR VARIOUS CATEGORIES

A CEILING ≥ 1000 FEET AND VISIBILITY ≥ 3 MILES	*	%
B CEILING 500-900 FEET AND VISIBILITY ≥ 1 MILE, OR VISIBILITY ≥ 1 MILE BUT < 3 MILES AND CEILING ≥ 1000'	*	%
C CEILING < 500 FEET AND OR VISIBILITY < 1 MILE	*	%
D INSTRUMENT: CEILING ≥ 200 FEET AND VISIBILITY ≥ 1/2 MILE, AND EITHER CEILING < 1500 FEET OR VISIBILITY < 3 MILES	*	%

SOURCE OF DATA Datsav, National Intelligence Survey, Index of Climatic Data * denotes data not available

T denotes trace ** max 24 hr precip taken from 1915-1923 period of record

ANNUAL WIND COVERAGE TABULATION

RUNWAYS OR COMBINATIONS FOR CROSSWIND COMPONENT 10 KNOTS OR LESS

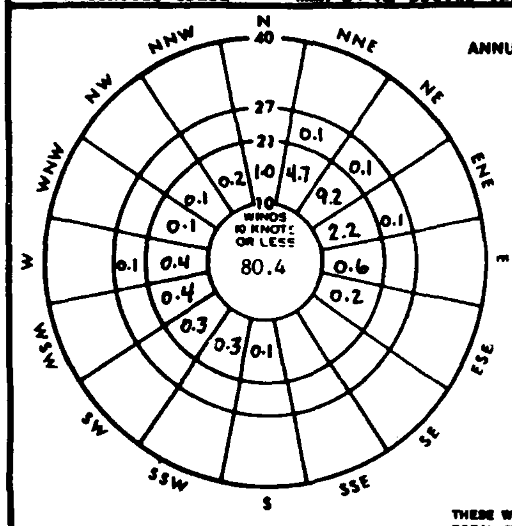
RUNWAY DIAGRAM	MAGNETIC MARK	TRUE BEARING	LENGTH IN FEET	(1)	(2)
	050/230	W 04°	9436	91.1%	97.3%

INSTRUMENT RUNWAY
(1) WIND COVERAGE (%) - ALL WEATHER
(2) WIND COVERAGE (%) - INSTRUMENT

ADDITIONAL DATA

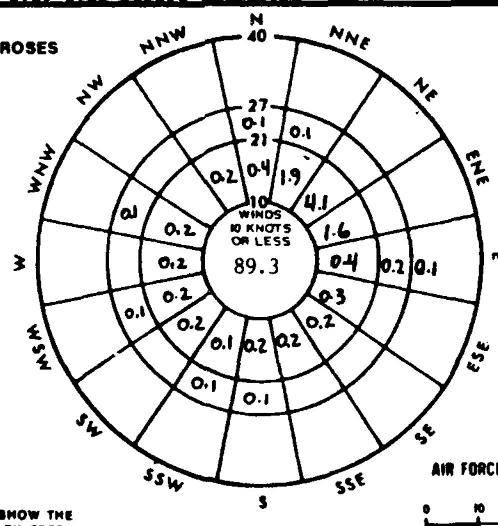
FIELD ELEVATION 9527 FEET MSL
MAGNETIC VARIATION 4° 06'W
SOURCE DOD FLIP
YEAR 1986

ANNUAL WIND ROSES



ALL WEATHER

NOTE:
THESE WIND ROSES SHOW THE TOTAL % OF WINDS BY SPEED GROUP AND DIRECTION BASED ON TRUE BEARING.



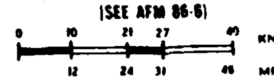
INSTRUMENT

ENGINEERING WEATHER DATA

AIR CONDITIONING DESIGN AND CRITERIA DATA (SEE AFM 88-8, CHAP 6)
WINTER HEATING DESIGN TEMPERATURE (SEE AFM 88-8, CHAP 6)
MEAN WINTER WIND SPEED 6.5 KNOTS
MEAN ANNUAL NUMBER OF HEATING DEGREE DAYS 2134 (SEE AFR 91-7)
PRESSURE ALTITUDE AND TEMPERATURE DATA FOR DETERMINING REQUIRED RUNWAY LENGTHS (SEE AFM 86-2)
EXTREME WIND DATA FOR CONSTRUCTION DESIGN (SEE AFM 88-3, CHAP 1)
SNOW LOAD DATA FOR ROOF CONSTRUCTION (SEE AFM 88-3, CHAP 1)
MAXIMUM FROST PENETRATION (SEE AFM 88-3, CHAP 1)
MEAN ANNUAL COOLING DEGREE DAYS 481

NOTICE: WHEN NECESSARY, INTERPRETATI[illegible] OF THESE DATA SHOULD BE SECURED THROUGH THE LOCAL STAFF WEATHER OFFICER

AIR FORCE RUNWAY WIND COMPUTER (SEE AFM 86-6)



SUCRE, BOLIVIA
19°00'S 65°17'W
9527 ft
Prepared by USAFETAC
April 1989

TAB D

USAFETAC Form 49 MAY 86

FORM REVISED 1 DEC 7